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CLASSIFICATION, RECONSTRUCTED PHYLOGENY AND GEOGRAPHICAL HISTORY OF WEEVILS OF THE GENUS *PANSCOPUS* SCHÖNHERR, AND CLADISTIC RELATIONSHIPS AMONG GENERA OF THE TRIBE LEPTOPIINI OCCURRING IN NORTH AND CENTRAL AMERICA (COLEOPTERA:CURCULIONIDAE:ENTIMINAE)

by

TIMOTHY GORDON SPANTON

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A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

DEPARTMENT OF ENTOMOLOGY

EDMONTON, ALBERTA

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THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled "Classification, Reconstructed Phylogeny, and Geographical History of weevils of the genus *Panscopus* Schönherr, and cladistic relationships among genera of the tribe Leptopiini occurring in North and Central America" submitted by Timothy Gordon Spanton in partial fulfillment of the requirements for the degree of Doctor of Philosophy

Dr. George E. Ball (Supervisor)

Dr. John R. Spence

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Date: 14 April 1992

ABSTRACT

A cladistic analysis based on adult structural characters was performed using exemplars of each of seven tribes of broad-nosed weevils of the curculionid subfamily Entiminae (Leptopiinae of authors). The results show the tribe Leptopiini to be most closely related to the South American tribe Premnotrypini and the North American tribe Ophryastini to be most closely related to the South African tribe Leptostethini. An adelphotaxon relationship is hypothesized between the Leptopiini+Premnotrypini and the Ophryastini+Leptostethini.

Cladistic analysis of representatives of 28 genera of Leptopiini occurring in North and Central America, resulted in a partially resolved phylogenetic reconstruction. *Panscopus* Schönherr is the hypothesized adelphotaxon of a five-genus clade which includes *Phyxelis* Schönherr, *Tropiphorus* Schönherr, *Lepesoma* Motschulsky, *Amphidees* Schönherr, and *Paranametis* Burke.

A cladistic analysis of the species of *Panscopus* produced a hypothesized phylogeny upon which a subgeneric classification is based. Five subgenera are recognized, all hypothesized to be monophyletic: *Parapanscopus* Buchanan, *Panscopus sensu stricto* , *Pseudopanscopus* Buchanan, *Dolichonotus* Buchanan, *Phymatinus* LeConte (redefined) and *Nocheles* LeConte and Horn (redefined). The following new subgeneric synonymies are presented: *Phymatinus* LeConte 1869 (=*Panscopidius* Pierce 1913); *Nocheles* LeConte and Horn 1876 (=*Nomidus* Casey 1895, and *Neopanscopus* Pierce 1913).

A key to the subgenera and species for adult specimens of *Panscopus* is provided. For each species of *Panscopus* a systematic treatment is provided. The following species-group nomenclatural changes are presented: *P. (Parapanscopus) ovatipennis verrucosus* Buchanan 1936 is treated as a junior synonym of *P. (P.) ovatipennis* Buchanan 1936; *P. (Dolichonotus) acutisetus* is described as new; *P. (Nomidus) pallidus* Buchanan 1927 is treated as a junior synonym of *P. (Nocheles) torpidus* LeConte 1857; *P. (Phymatinus) longiscapus* is proposed as new for specimens of *P. torpidus auctorum, nec* LeConte; *P. remotus* Van Dyke 1949 is a junior synonym of *P. (Nocheles) rugicollis* Buchanan 1927.

A biogeographical analysis of *Panscopus*, relating zones of disjunction between geographical ranges of sister lineages to known geological or paleoclimatological and paleoecological events, suggests that the genus arose during the Tertiary period. Most cladogenesis occurred in late Eocene to Miocene times, whereas later Tertiary (Pliocene), and Pleistocene times were likely periods of extinction, or extirpation.

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1. INTRODUCTION

Representatives of the genus *Panscopus* are flightless, slow-moving weevils which feed nocturnally on the foliage of broad-leaved woody shrubs of the understory of forested regions in North America. There are twenty-seven species in the genus, and their collective geographical ranges are limited to the North American continent. The genus was described by Schönherr in 1842 based on *Barynotus erinaceus* Say, 1831. Pierce (1913) revised the genus, including species described under other generic names by LeConte (1857), Horn (1876), and Casey (1895), and he established a subgeneric classification. Later, Buchanan (1927, 1936) revised the genus, described several new species and incorporated species described by Blatchley (1916), and Van Dyke (1935, 1936). Since that time, several additional species have been described by Ting (1938), Van Dyke (1949) and Hatch (1971). However, previous to the present work, the classification of this group has not been placed on a phylogenetic basis.

The tribe Leptopiini, to which *Panscopus* belongs, is a group of approximately 613 species in 88 genera worldwide (Schenkling and Marshall, 1931; O'Brien and Wibmer, 1982; Wibmer and O'Brien, 1986). The fauna of the Leptopiini limited to North and Central America consists of 151 species classified in 28 genera (O'Brien and Wibmer, 1982). No attempt has been made to hypothesize phylogenetic relationships among the genera of this tribe.

Similarly, little attempt has been made to hypothesize phylogenetic relationships among the tribes of the subfamily Entiminae, to which the tribe Leptopiini belongs.

The objectives of this study were: (1), to carry out a cladistic analysis of the tribes of the subfamily Entiminae, using exemplars of the type genus of each, primarily to establish the sister group of the Leptopiini; (2), to carry out a cladistic analysis of the genera of the tribe Leptopiini occurring within the North and Central American regions using exemplars of the type species for each; (3), to carry out a cladistic analysis of the species of *Panscopus* to revise their classification; (4), to provide a new key for identification of specimens of *Panscopus* which includes species described since the last revision; (5), to add to the known information concerning host plants and geographical distributions of the species of *Panscopus* ; and (6), to search for biogeographical correlates and erect hypotheses regarding the evolutionary history of the genus.

2. MATERIALS AND METHODS

Material

This study is based on more than 5,300 adult specimens of *Panscopus*, and several hundred additional specimens representing genera of Leptopiini and other tribes of Entiminae. Most of the material was obtained on loan from the institutions and private collections indicated in the following list. Most codens for the respective collections are those used by Arnett and Samuelson (1986) in their list of The Insect and Spider Collections of the World. For private collections not listed in Arnett and Samuelson (1986) I have designated a coden based in part on the initials of the individual. Codens are used subsequently to indicate the residence of specimens in the compiled distribution data for each species. Curators, and/or staff members with whom I corresponded, are named following their respective institutional addresses.

AMNH American Museum of Natural History, Department of Entomology, Central Park West at 79th Street New York, New York 10024. (L. H. Herman).

ANSP Academy of Natural Sciences of Philadelphia, 19th and The Parkway, Philadelphia Pennsylvania 19103 (D. Azuma, R. Griffith).

BMNH British Museum (Natural History), Department of Entomology, Cromwell Road, London, England SW7 5BD (C. N. C. Lyal).

BYUC Brigham Young University, Department of Zoology, 262 Brimhall Building, Provo, Utah 84602 (S. L. Wood).

CAES Connecticut Agriculture Experiment Station, 123 Huntington Street, Box 1106, New Haven, Connecticut 16504 (C. T. Maier).

CASC California Academy of Science, Department of Entomology, Golden Gate Park, San Francisco, California 94118 (D. H. Kavanaugh, R. Bret).

CDAE California State Collection of Arthropods, Insect Taxonomy Lab, California Dept. of Food and Agriculture, 1220 N Street, Sacramento, California 95814. (T. N. Seeno).

CIDA College of Idaho Collection, Orma J. Smith Museum of Natural History, College of Idaho, Caldwell, Idaho 83605 (G. A. Shook).

CNCI Canadian National Collection of Insects, Biological Resources Division, Centre for Biological and Land Resources Research, Agriculture Canada, Ottawa, Ontario K1A OC6 (D. E. Bright, S. Allyson-Morello).

CUIC Cornell University, Department of Entomology, Comstock Hall, Ithaca, New York 14853 (J. K. Leibherr).

CWOB Charles W. O'Brien Collection, Department of Entomology-Biocontrol, Florida A&M University, Tallahassee, Florida 32307

DEUN Division of Entomology, University of Nebraska State Museum, W 436 Nebraska Hall, Lincoln, Nebraska 68503 (B. Ratcliffe).

EMUS Entomological Museum, Utah State University, Department of Zoology, Logan, Utah 84231 (W. J. Hanson).

FMNH Field Museum of Natural History, Roosevelt Road at Lakeshore Drive, Chicago, Illinois (J. S. Ashe, P. Parillo).

HAHC Henry and Anne Howden Collection, Biology Department, Carleton University, Colonel By Drive, Ottawa, Ontario K1S 5B6 (A. T. Howden).

ICCM Carnegie Museum of Natural History, Division of Entomology, 4400 Forbes Avenue, Pittsburgh, Pennsylvania 15213 (R. L. Davidson).

INHS Illinois Natural History Survey, Section of Faunistics and Insect Identification, 607 East Peabody Drive, Champaign, Illinois 61820 (K. McGiffen).

ISUI Iowa State University Insect Collection, Department of Entomology, Iowa State University, Ames, Iowa 50011 (R. E. Lewis).

JLCC J. L. & B. L. Carr Collection, 24 Dallrymple Green NW Calgary, Alberta Canada T3A 1Y2 (J. L. Carr).

KSUC Kansas State University, Department of Entomology, Manhattan, Kansas 66506 (H. D. Blocker).

LACM Los Angeles County Museum of Natural History, 900 Exposition Boulevard, Los Angeles, California 90007 (R. Snelling).

MCZC Museum of Comparative Zoology, Department of Entomology, Harvard University, Cambridge, Massachusetts 02138 (S. Shaw, D Furth)

MTEC Montana State University Entomological Museum, Department of Entomology, Bozeman, Montana 59717 (M. A. Ivie).

NAUF Northern Arizona University, Department of Biological Sciences, Flagstaff, Arizona 86011 (C. D. Johnson).

NCSU North Carolina State University, Department of Entomology, Box 7613, Raleigh, North Carolina 27695 (C. Parron).

NDSU North Dakota State University, Department of Entomology, Fargo, North Dakota 58102 (E. U. Balsbaugh, Jr.).

NFC Northern Forestry Centre, Forestry Canada, 5320-122 Street, Edmonton, Alberta T6H 3S5 (D. W. Langor).

NMDC N. M. Downie Collection, 505 Lingle Terrace, Lafayette, Indiana 47901

ODAC Oregon Department of Agriculture, Entomology Section, Plant Division, Salem, Oregon 97310 (R. L. Westcott).

OSUO Oregon State University, Department of Entomology, Corvallis, Oregon 97331 (G. Parsons).

OSUC Ohio State University, Department of Entomology, 1735 Neil Avenue, Columbus, Ohio 43210 (C. A. Triplehorn).

PURC Purdue University,Department of Entomology, West Lafayette, Indiana 47907 (A. Provonsha).

RHTC Robert H. Turnbow Collection, Directorate of Engineering and Housing, Building 1404, Fort Rucker, Alabama 36362

RSAN Robert S. Anderson Collection, Department of Entomology, Texas A&M University, College Station, Texas 77843

SMDV Spencer Entomological Museum, Department of Zoology, University of British Columbia, Vancouver, B. C., Canada V6T 2A9 (S. Cannings).

TAMU Texas A&M University, Department of Entomology, College Station, Texas 77843 (H. R. Burke).

UAIC University of Arizona, Department of Entomology, Tucson, Arizona 85721 (F. G. Werner, C. A. Olson)

UCDC University of California, Davis, R. M. Bohart Museum of Entomology, Davis, California 95616 (R. Schuster).

UICM University of Idaho College, Department of Plant, Soil and Entomological Sciences, Moscow, Idaho 83843 (F. Merickel).

UMMZ University of Michigan Museum of Zoology, Insect Division, Ann Arbor, Michigan 48109 (M. F. O'Brien).

USNM United States National Museum/ USDA Systematic Entomology Lab, Washington, D.C. 20560 (D. R. Whitehead).

UWEM University of Wisconsin Entomology Museum, 237 Russell laboratories, 1630 Linden Dr., Madison, Wisconsin 53706 (S. Krauth).

WECC W. E. Clark Collection, Department of Entomology, Auburn University, Alabama 36849-5413

WSUC Washington State University, Department of Entomology, Pullman, Washington 99164 (R. Zack).

Methods

Collection and preservation of specimens— Most specimens of *Panscopus* and other representatives of Leptopiini collected in the field were taken at night using a headlamp and a standard entomological beating sheet. A sheet of approximately one meter square was held at the corners by two crossed poles. This was held underneath low shrubs or branches of taller shrubs and trees, while the vegetation was beaten with a stick. Weevil specimens falling onto the sheet were picked up manually and placed in vials containing either 70% ethanol, or a dilute solution of detergent and water, and were transferred later to ethanol for temporary storage until the material could be subsequently mounted on insect pins in a laboratory setting. Representatives of Leptopiini are found infrequently on vegetation during daylight hours.

A very few specimens of *Panscopus* were found by sifting litter. Sifted litter either was spread on a white sheet and picked through by hand, or was placed in Berlese funnels for extraction of arthropod material. Sifting litter was labour intensive and time consuming, and rarely resulted in finds of *Panscopus* specimens, even when large amounts of litter were sifted from the immediate vicinity of shrubs from which adult specimens had been collected in series, during previous night collecting efforts.

In a few instances, I have found specimens of *Panscopus* and other taxa of Leptopiini in the sunken troughs of flight intercept traps. These were undoubtedly captured by pitfall effect, because all of the taxa of North and Central American Leptopiini which I have investigated to date are

brachypterous and have fused elytra. Troughs of intercept traps and pitfall tubs contained water, a few drops of dish detergent, and were salted heavily, if such traps were to be checked at intervals of a few days. Traps to be checked at intervals of more than a week were charged with a solution of ethylene glycol in the form of commercially available automobile engine antifreeze, diluted to approximately 50% with water. Specimens extracted from either such solution were placed in a dilute soap solution to remove residues and other debris, and were placed subsequently in 70% ethyl alcohol for temporary storage.

Some specimens taken by hand, or with a beating sheet, were taken back to the laboratory alive. These were held in margarine tubs with surficial soil from the habitat from which they were collected, loose leaf litter and fresh vegetation from the host plants from which they had been taken. Numerous holes were punched in the lids of the containers. Such adults were fed on a diet of leaves of the same species of tree or shrub, or, where that was not possible, with foliage of congeneric plants. In these instances, this meant leaves of *Betula* , *Amelanchier*, *Prunus*, or *Vaccinium*. Most live specimens of *Panscopus* died within a few weeks; none survived more than three months in captivity. A few pairs were seen in copula, but no weevil larvae were subsequently found in the soil of any container.

One larval specimen representing the genus *Panscopus* has been described by Emden (1952), indicated as "*Panscopus torpidus* Lec.", collected at Puyallup, Washington, 20.X.34. I have seen three larval specimens (USNM), two in alcohol, and one slide-mounted (probably the specimen which Emden described), all collected at Puyallup, Washington, 20-X.34, reared by Wm. W. Baker, identified as *Panscopus torpidus*. Unfortunately it is uncertain whether this identification means *P. torpidus* (LeConte) 1857 (=*P. pallidus* Buchanan 1927), or the species to which Pierce (1913) and subseqent authors erroneously applied the name *P. torpidus*. See the classification section, below, for clarification of the nomenclatural problem. These are the only known immature specimens representing the genus *Panscopus*.

Examination and dissection of specimens — Specimens were examined using a Wild M5™ binocular dissecting microscope, at magnifications varying from 12X to 62.5X.

Dissections were performed by first relaxing pinned specimens in a bath of warm dilute soapy water for one to several hours. To dissect the genitalia, a scalpel was used to separate the elytra along the fused midline, and to separate the abdominal sterna from the terga. A pair of fine forceps was then placed into the abdominal space and the abdominal contents, including the terga, genitalic armature and reproductive system, and midgut, etc., were removed. Before clearing, these tissues were teased apart with the aid of fine forceps and/or a number one insect pin. Specimens were cleared in a *c* 10% KOH solution. In some instances this was warmed on a hot plate for 5 - 15 minutes, while observing the specimen every few minutes, until the desired amount of clearing had occurred. Leaving the specimen in cold (ambient room temperature) KOH for six to 18 hours produced adequate clearing of many specimens. The material was removed from KOH, and washed in a small petrie dish of distilled water, before being placed in glycerine. Further dissection and examination of genitalic structures was done in glycerine. The styli of the coxites of females

were examined further by placing them on a temporary mount on a well slide, in glycerine and were examined under higher magnification with the aid of a Leitz Wetzlar SM-LUX™ compound brightfield microscope. Dissected parts were placed, for temporary storage, in glycerine in O'Hara trays (O'Hara and McIntyre 1984), so they could be re-examined easily at a later time, and compared with other specimens, with a minimum of handling.

Early in the study, attempts were made to evert and inflate the internal sac of the male aedeagus, following a technique described by Thompson (1988). In this technique, the internal sac of the aedeagus was everted by slow and gentle tugs using a hooked minuten pin mounted on the end of a wooden probe, inserted into the apex of the aedeagus. Inflation is accomplished by placing the end of the aedeagus into the end of a piece of narrow neoprene, or some other synthetic tubing. the end of the tubing is held by a pair of forceps held in a rubber stopper in a clamp on a retort stand. A rubber band is used to hold the forceps closed, with enough force to hold the aedeagus in the end of the tubing, but not to clamp off fluid flow into the aedeagus. The other end of the tubing is attached to a syringe loaded with glycerine, held by a clamp on the retort stand. The plunger of the syringe is then pushed on to force just enough fluid pressure through the glycerine in the tube, to cause the internal sac to inflate. It was my experience, after trying several minor variations of this technique, that it is best used on larger specimens of 15 to 20 mm body length or larger. With smaller specimens in the five to eleven mm size range (most species of *Panscopus* are between five and nine mm in overall length), the aedeagus is too small. Even a very small hook on the minuten pin was sufficiently large to split the aedeagus in two when inserted into the apex. If the aedeagus did not split, the internal sac was frequently torn badly on eversion. If eversion was marginally successful, the pattern of tears, was sufficiently variable among individuals of a species, to mask any interspecific variation which might be taxonomically useful. Similarly, attempts to inflate the sac met with little success. It was difficult to find tubing small enough to hold the aedeagus so that most of the glycerine did not flow out of the tube around the aedeagus, or simply push the aedeagus out of the tube. Also, for the sacs which had been torn by the minuten pin inflation was not possible. After damaging a number of genitalic specimens, this technique was discontinued in favour of simply clearing the specimen as well as possible and observing any sclerotized structures, or fields of spicules of the sac on an un-everted specimen.

Mouthparts were examined from representative specimens of each species of *Panscopus*, as well as representatives of a number of other genera of the tribe Leptopiini. To examine mouthparts, the head was removed from a specimen which had been relaxed in warm water, as described above, and the head was cleared in KOH as described for genitalic specimens above. The head was rinsed in distilled water and then placed in 10% hydrogen peroxide, to bleach lightly the mouthparts for better examination. Subsequently, the head was placed in a petrie dish in distilled water. Mandibles, prementum, and maxillary palpi were removed from the head using a hooked minuten pin mounted on the end of a wooden probe. The mouthparts were placed in glycerine on a well slide and examined under a brightfield microscope. The head was dried and glued to a card which was placed on the pin of the

associated specimen. Mouthparts were placed in a drop of glycerine in a microvial along with any genitalic structures dissected from the same specimens, and were, in each instance, attached to the pin of the specimen from which they were taken. Because I observed insufficient variation in structure of the mouthparts among species of *Panscopus*, as well as among genera of Leptopiini, the extraction and examination of mouthparts was discontinued.

Terms — Terms used for structural characters follow Kissinger (1970) and other authors. For some characters of the internal sac of the males, and for structures within the bursa copulatrix of females, no nomenclature has been established, so in these instances I have used informal descriptive words or phrases. It is hoped that future revisionary work on broad-nosed weevil groups will contribute to the establishment of homologies for structures of the internal sacs and sclerites of the bursae in the Leptopiini , and that a more standardized nomenclature will be developed.

Characters of the vestiture of scales and setae are useful in both identification and phylogenetic inference. I use the words 'appressed', 'decumbent', 'semi-erect', and 'erect' to describe the angle of setae, relative to the adjacent surface of the exoskeleton. Appressed setae are those which lie at an angle of less than 15° to the surface; decumbent, 15-45°; semi-erect, 45-75°;and erect, 75-90°. I subjectively characterized setae as thin and pointed, slightly flattened, or very flat, meaning spatulate and blunt-ended. Although the third condition is scale-like, in most instances where I have used this state designation, the setae are longer than surrounding scales, and are not appressed, as are the surrounding scales.

Illustrations — Line drawings were made with the use of a camera lucida attached to either a Wild M5™ binocular microscope or a Leitz SM-LUX transmission microscope. Drawings of genitalic structures or mouthparts were made first on paper, in pencil and then traced, in ink onto mylar film for reproduction.

Measurements and descriptive statistics— Nine measurements were taken to demonstrate overall size of specimens and to investigate differences in relative width, length and length of rostrum, scape *etc.* Measurements were made with the use of an ocular micrometer in a Wild M5™ binocular dissecting microscope. The measurements taken were as follows:
LOA, overall length of specimen. This measurement was taken to provide an estimate of the overall size of weevils of a given species, with the knowledge that telescoping of body segments, and the angle at which the head is held at time of death all add to the variation in this measurement, among individuals.
WH, maximum width of head, near base, in dorsal view.
WF, minimum width of frons, between eyes, in antero-dorsal view;
LR , length of rostrum from anterior margin of eye to apex;
LAS, length of antennal scape, measured in lateral view;
WP, maximum width of pronotum at or near middle;
LP, length of pronotum from anterior to posterior margin along midline in dorsal view;
WEI, width across both elytra measured at widest point in dorsal view;

LEI, length of elytra measured along suture from apex of scutellum to posterior margin, in dorsal view.

Descriptive statistics are presented in tabular form. I attempted to select a sample of at least ten males and ten females for each species, with the exception of those species for which ten specimens of each sex were not available. For as many species as possible, the sample is comprised of individuals collected at one locality at one time. In a few instances such samples were not available, and a series of specimens representing one sex of one species was selected from more than one locality. Where five or more specimens of one sex of one species are available, I present range, mean, 1.5 standard deviation and 2 standard errors as suggested by Hubbs and Hubbs (1953) and practiced by Whitehead (1971), O'Hara (1982) and Anderson (1987). If two samples differ from one another by a non-overlap of 1.5 standard deviations from the means, this corresponds to a t-test significant at the 0.05 level of probability, and indicates that they are statistically significantly different. A difference of 1.5 standard deviations indicates that 90% of specimens from one sample can be separated form 90% or more of the other sample, and is a more critical tool than is one standard deviation (Mayr *et al*. 1953).

Notes about descriptive format — For each species treated, as well as for each subgenus of *Panscopus* , and for the genus *Panscopus* , a complete list of synonymies is presented. The synonymical lists do not, in all instances, include all published uses of a given name, but all published works are listed which, to the best of my knowledge, indicate a taxonomic opinion concerning the status of a given formal name.

Type specimens are listed for each species treated, and in some instances for conspecific taxa as well. Holotypes was examined for each species of *Panscopus* , with the exception of Thomas Say's species. Label data for types which is in quotation marks is listed verbatim as on the label(s), with a semicolon (;) indicating a separate label, and a backslash (/) separating lines on a label. Additional notes about synonymy, are added, as deemed necessary. The derivation of the name, as accurately as can be inferred, is presented for each taxon treated.

A diagnosis is presented, of characters which can be used to distinguish a species from phenotypically similar, or closely related species, with which it may be confused.

Species descriptions are presented in the same format throughout in the interest of making the differences among the species apparent. Characters which typify the genus, or a higher taxon are not repeated for each species.

Life history data are presented for each species. For most of the species of *Panscopus*, only the dates of collection of adult pinned specimens are available as clues to the seasonality of the adult life stage. Available published information concerning life history is included.

Under the heading "Host Plant Associations" are listed plant names which appear on specimen labels, indicating the number of specimens of a species which I saw bearing a given plant name. Also included are published host plant names, in instances where such records exist. I have listed these "host plants" with the knowledge from both my own field work, and from the

number of plant names associated with some of the species of *Panscopus*, that adults of this genus are quite catholic in their food choices. They seem able to feed on the foliage of a wide variety of broad-leaved shrubs and young trees and a few specimens have been taken even from herbaceous plants. With little knowledge of the larvae other than that many broad-leaved weevils are root feeders in their larval stages (Kissinger, 1964), it is possible that the larvae have more specific, or different host plant requirements than the adults.

The geographical distribution is provided for each species in a brief verbal statement , as well as in the form of amap. I have included locality records on the distribution maps from specimen labels, as well as published records, in instances where the identification of the specimens in question seemed reliable.

Under the heading "material examined", I include lists of all of the specimens which have come to my attention, alphabetically by country, state or province, county and locality. For each record of specimens, the date of collection is included, where available, the collector or collection from which it came, and the number of specimens in the series and the coden to indicate the collection in which the series is presently housed.

For each subgenus I provide a list of synonyms similar to that provided for each species, the derivation of the name, a diagnosis, a list of included species, and brief remarks about phylogenetic relationships. I have not included a description, because I believe a statement of diagnostic characters is sufficient.

Criteria for ranking of taxa – My concept of a bisexually reproducing species is essentially that of Mayr (1969), that is, a collection of interbreeding populations which are reproductively isolated from all other populations. Reproductive isolation is inferred from phenetic divergence in structural characters, and from distributional data.

I have not used the subspecies category in this study because most species do not exhibit sufficiently geographically variant populations to warrant application of trinomials, or there was not a sufficiently detailed study of geographical variation in a species to determine if a subspecific name might be appropriate.

Decisions at the generic level did not figure prominently in this study. The cladistic analysis of genera of the tribe Leptopiini was carried out for heuristic reasons- to establish a preliminary, tentative framework for future systematic studies in the group, and to identify problem areas for additional research, not to establish the limits of genera in the tribe. I offer only the comments that monophyletic genus-group taxa are preferred, and under some circumstances paraphyletic taxa are acceptable. Polyphyletic taxa are not acceptable in a phylogenetic classification.

3. HISTORY OF THE SUBFAMILIAL AND TRIBAL CLASSIFICATION OF BROAD-NOSED WEEVILS

As knowledge of weevil relationships improved, limits of groups and use of names of higher taxa (*i.e.* those of family-group) changed. The names and ranking of higher taxa used in this presentation are based on the following historical considerations.

Lacordaire (1963), arranged the genera of Curculionidae in two "Légions", the "Adélognathes", and the "Phanérognathes". The former included weevils with a large mentum, closing the buccal space and concealing the maxillae. They also exhibited a broad robust rostrum. The latter group included weevils with a smaller mentum, not closing the buccal space and the maxillae were visible. The Adelognathes, which have come to be known colloquially as the broad-nosed weevils, were organized into two groups. First, the "Adélognathes Oxyophthalmes" were those broad-nosed weevils with eyes large, depressed, transverse, and narrowed below, and with well-developed postocular lobes on the anterior margin of the prothorax. Second the "Adélognathes Cyclophthalmes" included all those broad-nosed weevils with eyes round and postocular lobes indistinct. Lacordaire (1863, p. 5) was aware of the deciduous cusps on the mandibles of young adults of many taxa of broad nosed weevils, and speculated on the use of such structures in tearing the way out of the pupal case, but did not use this character in classifying the weevils. The Adélognathes Oxyophthalmes of concern here, were grouped into three tribes including the imprecisely defined "Tribu V. Leptopsides", based on the genus *Leptops* Schönherr. This Tribu Leptopsides, was treated by many subsequent workers as a subfamily, and Lacordaire's organization of the genera into the groups Strangaliodides, Leptopsides vrais, Ophryastides, Leptostethides, Hypsonotides, and Entimides has been carried on, with many variations. In subsequent classifications these groups have been recognized as tribes, by most authors. Schenkling and Marshall (1931) and O'Brien and Wibmer (1982) combined Lacordaire's Strangaliodides and Leptopsides vrais in the tribe Leptopiini. Lacordaire's Tribu Leptopsides includes most of the genera which more recently have been placed in the Leptopiinae or the tribe Leptopiini. A notable exception is the Tribu Promecopsides, which includes "broad-nosed" weevils, but was placed by Lacordaire in the Phanerognathes. Similarly, Lacordaire (1863) did not recognize the Alophini, including genera such as *Alophus* and *Lepidophorus* (now classified in the Leptopiini [O'Brien and Wibmer 1982]) as broad-nosed weevils and placed them in his Tribu Hyperides in the Phanerognathes.

LeConte (1874) placed the broad-nosed weevils in the separate family Otiorhynchidae based on the shared character of the mandibular scar of adults, indicative of the possession in the early imago stage, of a deciduous cusp on each mandible. The remaining true weevils (the Phanerognathes of Lacordaire) he placed in the family Curculionidae. LeConte and Horn (1876) continued the use of family Otiorhynchidae for all broad-nosed weevils with mandibular scars. In their classification they combined under the tribal name Ophryastini a group of genera similar to the complex placed in the tribes Ophryastini plus Leptopiini in more recent classifications (Kissinger, 1970; O'Brien and Wibmer, 1982). LeConte and Horn's groups within their Ophryastini approximate those of

Lacordaire, but they combined under the name Strangaliodes the "Strangaliodides" and "Leptopsides vrais" of the latter author. LeConte and Horn recognized the Promecopini as broad-nosed weevils in the sense of having mandibular scars, and placed them in their Otiorhynchidae next to the Phyllobiini. They continued to place the Alophini (*Trichalophus, Plinthodes, Triglyphulus, Lepidophorus* and others) in the Phanerognathes by including them in the family Curculionidae.

Pierce (1913) followed Bedel (1885) in using the family name Brachyrhinidae to refer to all of the broad-nosed weevil groups. In the Brachyrhinidae Pierce (1913) recognized eight subfamilies. He applied correctly the name Entiminae (based on the generic name *Entimus* Germar 1817) to most of the same taxa which Lacordaire (1863) had included in his "Tribu Leptopsides". Pierce included the tribes Ophryastini, Tropiphorini, Leptostethini, Monœtiini, and the Entimini, all of which seemed inadequately defined. He did not indicate taxa included in the Entimini – presumably this taxon was intended to be similar to that of the Entimides of Lacordaire. Pierce's Menœtiini remained inadequately defined and no indication of included taxa was given. Pierce's Leptostethini no doubt refers to the South African group Lacordaire called the Leptostethides and his Ophryastini included approximately the same taxa as Lacordaire's Ophryastides. Pierce used the tribal name Tropiphorini to refer to a group of North American genera, some of which had been included by Lacordaire in the Strangaliodides, and in Horn's (1876) Strangaliodes.

Leng (1920) placed all or most of the taxa of "broad-nosed" weevils, in the sense of possessing mandibular scars, in the subfamily Otiorhynchinae in the family Curculionidae. There was no division between those with postocular lobes and those without. Other than ranking many taxa lower in the hierarchy than previous workers, Leng's classification reflected largely the groupings by Pierce (1913). *Phyxelis* was placed by itself in a tribe named Eremnini, and the Ophryastini, Tropiphorini, Dirotognathini and Promecopini, represented the same groupings as in Pierce (1913).

The classification of Schenkling & Marshall (1931) included in the subfamily Leptopinae only taxa with mandibular cusps and postocular lobes: (1), the monobasic tribe Dirotognathini; (2), the largely Central and South American Promecopini; (4), the tribe Leptopiini with the North American elements of the Tropiphorini of Pierce (1913), as well as a number of tropical American, Australian and African genera, some of which had been included in the groups Strangaliodides and Leptopsides vrais of Lacordaire (1863); (4), the predominantly Holarctic Ophryastini as in Pierce's classification; (5), the South African Leptostethini; (6), the very diverse and predominantly South American Hypsonotini; (7), the Neotropical Entiminae; and (8), the Eupholini, the members of which occur in the Indo-Australian archipelago.

Essentially the same classification, at subfamily and tribal levels, was used by Blackwelder (1947): the subfamily Leptopiinae included the tribes Promecopini, Leptopiini, Ophryastini, Hypsonotini and Entimini.

Vaurie (1951) included in the Leptopiinae the tribes Promecopini, Leptopiini, Ophryastini, Hypsonotini, and Entimini. She made no mention of the Eupholini of Schenkling and Marshall (1931), but she dealt with the New World

fauna only, and eupholines are restricted to the Old World Tropics. Vaurie (1951) stated that the Promecopini and Entimini are very closely related, that they are not adequately defined, and that maintaining them as separate groups was something of convenience, implying that they are not monophyletic entities. Voss (1934) apparently separated the Promecopini from the Entimini based on the former group exhibiting an acutely spined metepisternal swelling, however, as Vaurie (1951) pointed out, *Phaedropus* of the Entimini also has this acutely spined swelling . Vaurie (1951) opined that these two tribes could be separated only by the fact that the Promecopini are all small mostly brownish coloured weevils, and all species are smaller than the smallest of the Entimini.

Kissinger (1964) placed in the subfamily Leptopiinae, the tribes Ophryastini, Leptopiini, and Promecopini, excluding the Neotropical Hypsonotini and Entimini.

The use of the subfamily name Leptopiinae had become fixed over other minor variations in spelling (Kissinger 1970, Hatch 1971, O'Brien and Wibmer 1982, among others), after Zimmerman (1968) explained that the name Leptopinae, based on Leptopsides (Lacordaire 1863) had to be modified. The generic name upon which it was based, *Leptops* Schönherr (1823), was not available as it was a junior homonym of *Leptops* Rafinesque (1820), a genus of fishes. Oke (1951) proposed the replacement name *Leptopius* for the type genus and emended the subfamily name to Leptopiinae. Kissinger (1970) pointed out that for any family-group name including the tribes Entimini and Leptopiini, Entimides Schönherr (1823) takes priority over Leptopsides Lacordaire (1863), or any subsequent variation in the spelling of the subfamily name based on a replacement name for *Leptops*. Wibmer and O'Brien (1986) used the name Entiminae.

The tribes recognized in the subfamily, based on the most recently published classification (Wibmer and O'Brien,1986), for the South American fauna, are: Promecopini, Leptopiini, Premnotrypini, Lordopini, Entimini, and Cylydrorhinini. The tribe Premnotrypini was erected by Kuschel (1956) based on the genus *Premnotrypes* Pierce. The Lordopini , with many new genera added, are a group of genera similar to the Hypsonotini in earlier classifications dating back to the Hypsonotides of Lacordaire (1863). Kuschel (1955, p. 300) first used, correctly, the name Lordopini for this group. As Wibmer and O'Brien (1986) pointed out, Lordopini, based on "Lordopides" Schönherr (1823), takes priority over the family-group name Hypsonotini based on "Hypsonotides" Lacordaire (1863).

The Cylydrorhinini were transferred to the Entiminae from their former position among the Phanerognatha by Wibmer and O'Brien (1986) because Kuschel (1964) had pointed out that members of this group exhibit adult and larval characters of the broad-nosed weevils. Kuschel, however, did not indicate what any of these characters might be. It appears from examination of a few specimens of *Cylydrorhinus* that these weevils resemble entimines only superficially: the body is robust and the rostrum is broad and short, in proportion to overall size. However, they do not have scars on the mandible to indicate a point of attachment of the deciduous cusp, a very important apotypy defining the broad-nosed, or adelognathan groups of weevils. The adults of *Cylydrorhinus* have also a relatively broad buccal space, and a proportionately

very small, , prementum which does not fill all, or even most of the buccal space. The maxillae and maxillary palpi are large and readily visible in ventral view, as are the labial palpi at the apex of the prementum. This is in sharp contrast to the condition in the Entiminae (excluding Cylydrorhinini), in which the buccal space is filled by a relatively large prementum and the maxillae and maxillary palpi are hidden behind the prementum and the mouthparts must be extracted in order to observe the maxillae. Adults of *Cylydrorhinus* exhibit postocular lobes on the anterior margin of the prothorax as do the Entiminae. These prothoracic postocular lobes appear in a number of unrelated weevil groups, however, and therefore must represent convergence. The apparent lack of mandibular cusps and the basic phanerognathan mouthpart arrangement, suggest that the Cylydrorhinini should not be classified in the Entiminae, but within the phanerognathan groups as they had been previous to Kuschel (1964) and Wibmer and O'Brien (1986). The tribe Cylydrorhinini had been classified with the Listroderini in the subfamily Cylydrorhininae (O'Brien and Wibmer, 1982) and had been placed among the phanerognathan weevils in most earlier classifications. Clearly, the elucidation of more characters is needed, to determine the phylogenetic affinities of the Cylydrorhinini. I do not include the Cylydrorhinini among the Entiminae.

Exclusion of the Cylydrorhininae and inclusion of the south African Leptostethini brings to seven the number of tribes in the subfamily Entiminae.

Kuschel has circulated a proposed reclassification of the higher taxa of Curculionoidea which involves a great deal of rearrangement of the tribes and subfamilies of the Curculionidae. This new scheme continues to undergo changes and revisions, and has yet to be published. I base my study on the framework of classification of the Entiminae reflected in published works, as discussed above.

For the purposes of this study the subfamily Entiminae includes the tribes Premnotrypini, Promecopini, Lordopini, Entimini, Leptopiini, Ophryastini, and Leptostethini.

4. TRIBE LEPTOPIINI

Diagnostic characters of adults

Adult representatives of the tribe Leptopiini are adelognathan weevils with a scar on the mandibles at the point of attachment of the deciduous cusp, ten or fewer setae on the ventral surface of the prementum (in most genera three pairs, or fewer), and the scrobes are relatively indefinitely delineated both at dorsal margin and ventral margin, so that the scape passes over the middle of the eye or as low as the bottom quarter of eye, when resting next to head. Within the New World fauna, representatives of two other tribes, the Ophryastini, and the Premnotrypini somewhat resemble the Leptopiini in that they are all adelognathes, possessing a scar on the mandible, and postocular lobes on the anterior margin of the prothorax. Members of both the Ophryastini and the Premnotrypini are distinguished by the clearly delineated scrobes which direct the scape ventrally, below the eye. In addition, most ophryastine weevils possess approximately 15 setae on the ventral surface of the prementum (fewer in some species), and have the scape and funiculus of the antenna and dorsal margin of tarsal segments 1-3 clothed with decumbent to appressed, generally broad, imbricate scales.

Key to adults of the genera of tribe Leptopiini occurring in North and Central America.

The following key is based on Kissinger (1964) with some taxa removed from the subfamily Leptopiinae, and some added, to reflect the genera included in the tribe Leptopiini as in O'Brien and Wibmer's (1982) checklist of weevils of North and Central America. The genera added include *Trichalophus* LeConte, *Acmaegenius* LeConte, *Plinthodes* LeConte, *Triglyphulus* Cockerell, and *Lepidophorus* Kirby, all of which were included in the subfamily Alophinae, of authors, as well as *Amphidees* Schönherr, *Vitavitus* Kissinger, *Leptopinara* O'Brien, and *Connatichela* Anderson.

The couplets to identify *Trichalophus, Acmaegenius, Triglyphulus,* and *Plinthodes* are from Hatch (1971) with some modification. These couplets should be regarded as a temporary guide to identify specimens, for these taxa, as Krauss (pers. comm.) presently is studying these genera, and his work may result in a redefinition of the limits to some of these genera.

I have added couplets to the key to facilitate identification of specimens of the genera *Amphidees*, *Vitavitus*, *Leptopinara*, and *Connatichela*. However, the couplets for *Amphidees* remain problematic, as there are synonymies involving species of *Amphidees* , *Crocidema* , and *Lepesoma* , which I will deal with in a future paper. I believe that future study of these three genera will result in redefinition of genus group taxa. The monobasic genus *Synosomus* Jekel (based on *Synosomus geonemoides* Jekel 1858) remains an enigma. According to Sharp (1891) the holotype has been lost from the British Museum and I know of no paratype material or other specimens identified to this taxon. *Synosomus* therefore is not included in this key.

1 a) Antennal funiculus and dorsal portion of tarsal segments 1-3 with decumbent, usually broad scales 2

b) Antennal funiculus and dorsal portion of tarsal segments 1-3 without decumbent broad scales but with more or less erect, setiform or narrow elongate scales, or tarsi with few broad scales 5

2. (1a) a) Rostrum trisulcate; hind coxae separated by distance at least twice width of coxa; elytral striae not distinct, each elytron dorsally with two coarse, irregular, longitudinal costae and at apical fourth binodose ..... *Rhigopsis* LeConte

b) Rostrum not trisulcate, elytra not nodose at apical fourth 3

3. (2b) a) Fine pubescence absent from ventral surfaces of tarsal segments; both sexes with third tarsal segment slightly if at all wider than second; postocular lobes distinct; antennal scrobes shallow and markedly widened posteriorly ..... *Cimbocera* Horn

b) Fine pubescence at apices of tarsal segment three; third tarsal segment usually distinctly wider than second, especially on males 4

4. (3b) a) Postocular lobes prominent; antennal scrobe shallow and greatly widened posteriorly; rostrum not continuous with frons, separated by transverse impression ..... *Paracimbocera* Van Dyke

b) Postocular lobes small; antennal scrobes deep and only slightly widened posteriorly; rostrum continuous with frons ..... *Miloderes* Casey

5. (1b) a) Metepisternal suture present, well defined at least in basal half, complete, or obliterated; if obliterated, metepisternum with finer, smaller, and sparser scales than metasternum 6

b) Metepisternal suture obliterated entirely or in large part at least in basal half; metepisternum and metasternum with scales similar in coarseness, size, and density 13

6. (5a) a) Scar of mandible very small, not obvious, absent in some species; rostrum continuous with frons, not separated by distinct transverse impression (some *Plinthodes* with slight impression) ..... (Alophinae *auctorum*) 7

b) Scar of mandible, large round or subcircular; dorsal margin of scrobe indistinct posteriorly; scape rests on eye when retracted next to head; rostrum separated from frons by distinct transverse impression 12

7. (6a) a) Scar absent on mandible; scrobes not sharply defined posteriorly, scape directed over middle of eye; smaller beetles, length 2.75 - 5 mm. 8

b) Dorsal margin of scrobe sharply defined; scape directed below eye, or over lower portion of eye;large, robust beetles, length >11mm 9

8. (7a) a) Scape extended slightly beyond anterior margin of eye; frons with small lateral prominence above anterior margin of eye; frons not narrower than base of rostrum; postocular lobe small, with short vibrissae ..... *Vitavitus* Kissinger

b) Scape extended beyond middle of eye; frons without tubercle over dorsal margin of eye, tuft of setiform scales in its place or not; frons narrower than base of rostrum; postocular lobes reduced ..... *Lepidophorus* Kirby

9. (7b) a) Tarsal pubescence brush-like on ventral surface; rostrum with deeply impressed lateral sulci..... 10

b) Tarsi setose ventrally, third segment with pair of brush-like pads toward apex; rostrum finely sulcate, sulcus obsolete apically ..... *Acmaegenius* LeConte

10. (9a) a) Anterior margin of eye separated from rostrum by deep fine groove extended between lateral sulcus and scrobe ..... *Triglyphulus* Cockerel

b) anterior margin of eye not separated from rostrum by groove 11

11. (10b) a) Elytral striae very coarsely punctate; pronotum more or less sulcate long mid-line..... *Plinthodes* LeConte

b) Elytral striae rather finely punctate; pronotum in part carinate along mid-line..... *Trichalophus* LeConte

12. (6b) a) Sternum 2 longer than 3+4 united, suture between sterna 1 and 2 obliterated medially; first segment of tarsus 1 dorsally with sparse round scales ..... *Adaleres* Casey

b) Sternum 2 not longer than 3+4 united, suture between sterna 1 and 2 deep, straight; first segment of tarsus 1 without round scales on dorsal surface ..... *Lepesoma* Motschulsky

13. (5b) a) Frons distinctly narrower than rostrum at base; sternum 2 at middle more than twice as long as sterna 3+4 combined; tibia 3 with corbel open; scrobe not clearly defined posteriorly ..... *Dirotognathus* Horn

b) Frons not narrower than rostrum at base; sternum 2 distinctly less than twice as long as 2+3 combined..... 14

14. (13b) a) Tarsal claws connate at base; scape directed below eye..... ..... *Connatichela* Anderson

b) Tarsal claws free; scape directed over eye..... 15

15. (14b) a) Elytra with rows of large coarse pits, each covered by round or oval scale larger than surrounding scales; elytra usually with sparse, coarse, erect setosity; prementum with two setae, or none ..... *Panscopus* Schönherr p. 33

b) Punctures of elytral striae each either with fine seta, apparently glabrous, or punctures small and fine; prementum, in most taxa, with more than two setae on ventral surface 16

16. (15b) a) Scape of antenna with at least a few flat scales.....17

b) Scape of antenna without flat scales, either with suberect fine setae, or suberect, coarse, clavate, scale-like setae.....22

17. (16a)a) Tibia 3 with corbel closed (may be broadly and distinctly closed, or narrowly and indistinctly closed).....18

b) Tibia 3 with corbel open; body usually with crusty coating, with long erect, sparse, spatulate setae; dorsal margin of scrobe indistinct posteriorly, scape passes over middle of eye ..... *Phyxelis* Schönherr

18. (17a) a) Elytra with long, fine, erect setae, each seta about five times as long as diameter of adjacent scale; elytral scales flat, discrete, non-overlapping; tibia 3 with corbel distinctly closed, corbel plate clothed with flat, round scales ..... *Diamimus* Horn

b) Elytra without erect setosity (*Orimodema*) or with stout bristles not more than three times as long as diameter of scales (*Dichoxenus*); tibia 3 with corbel closed (may be narrowly closed) 19

19. (18b) a) Corbel narrowly and indistinctly closed, with scales on corbellar area; elytral scales dense, overlapping; elytral setae round and acute, semi-erect, much less than 5 times as long as diameter of adjacent scale .....*Amphidees* Schönherr (*A. longulus*)

b) Corbel distinctly closed, without scales on corbellar area.....20

20. (19b) a) Body elongate in form; elytra without erect setosity, scales of elytra not at all overlapping; dorsal margin of scrobe indistinct posteriorly; in dorsal view lateral margins of rostrum distinctly convergent from base at anterior margin of eye to about the middle, thence nearly straight to articulation of antenna .....*Orimodema* Horn

b) Body shorter and stouter in form; elytra with sparse, erect bristles; in dorsal view lateral margins of rostrum slightly, evenly convergent from base at anterior margin of eye to point of articulation of antenna 21

21. (20b) a) Sternum 8 of female markedly compressed in apical region, the vertical dimension much greater than horizontal dimension.....22

b) Sternum 8 of female shovel-shaped, with broad, laterally expanded process in apical region.....23

22. (21a) a) Elytra with non-overlapping scales, on dorsal surface with short, erect, clavate setae; scape densely scaly.....*Paranametis* Burke

b) Elytra with striate, overlapping scales; elytral setae thin, slightly flattened; scape sparsely scaly.....*Amphidees* Schönherr (in part)

23. (21b) a) Scape densely scaly; elytral setae blunt apically; elytral scales dense, overlapping and decumbent; ventral margin of scrobe clearly defined; corbel of tibia 3 very narrowly closed to open .....*Dichoxenus* Horn

b) Scape mostly setose with a few broad scales; elytral setae fine, acute; elytral scales discrete, non-overlapping, flat; ventral margin of scrobe poorly defined; corbel of tibia 3 distinctly closed ..... *Anametis* Horn

24. (16b) a) Basal margin of elytra produced markedly and abruptly into perpendicular cliff before margin with sclerites covered by prothorax 25

b) Elytra without distinct basal margin, evenly rounded to sclerites covered by prothorax (or elytra without erect setosity, *Melanolemma*); dorsal margin of scrobe poorly defined posteriorly 27

25. (24a) a) Dorsal margin of scrobe not defined posteriorly, scape passes over middle of eye; corbel of tibia 3 open; body lacks erect setae or scales ..... *Tropiphorus* Schönherr

b) Dorsal margin of scrobe clearly defined posteriorly, scape directed over lower portion of eye or below eye; corbel of tibia 3 narrowly closed 26

26. (25b) a) Body with erect fine setae, usually numerous ..... *Peritaxia* Horn

b) Body with granulate papillae ..... *Leptopinara* O'Brien

27. (24b) a) Elytra with long fine erect setae; elytral stria 10 extends posteriorly to above margin of posterior coxa, there becoming confluent with stria 9 ..... *Crocidema* Van Dyke *

b) Elytra without erect setae; elytra stria 10 obscure, does not join stria 9 28

28. (27b) a) Rostrum on dorsal surface flat, there with fine longitudinal glabrous median line; frons two-fifths wider than distance between lateral margins of rostrum at articulation of antenna in dorsal view; rostrum without deep, fine sulcus distad of eye ..... *Pseudorimus* Van Dyke

b) Rostrum on dorsal surface convex, there with very vague, low, median, longitudinal carina; frons much less than one-fifth wider then distance between lateral margins of rostrum at articulation of antenna in dorsal view; rostrum at base slightly distad of anterior margin of eye with short, deep, fine sulcus arranged perpendicularly to longitudinal axis of rostrum ..... *Melanolemma* Van Dyke

* The species *Amphidees macer* and *A. latifrons* key to this point.

5. CLASSIFICATION OF SPECIES OF THE GENUS *PANSCOPUS* SCHÖNHERR

Genus *Panscopus* Schönherr

Panscopus Schönherr 1842:267. Gender, masculine. Type species *Panscopus erinaceus* (Say) by original designation (Schönherr, 1842:267). Gemminger and Harold 1871:2307. Horn 1876:42. LeConte and Horn 1883:444. Pierce 1913:390. Blatchley and Leng 1916:103. (Leng, 1920):312. Buchanan 1927, 1936. Schenkling and Marshall 1931:39. (Blackwelder, 1939):66. Hatch 1971:288. O'Brien and Wibmer 1982:63.

Tyloderes LeConte 1869:381.

Phymatinus LeConte 1869:382. LeConte and Horn 1876:53. LeConte and Horn 1883:444.

Panscopideus . Blackwelder 1939:66 [error]

Nocheles LeConte 1874:453. Horn 1876:54. LeConte and Horn 1883:444.

Pseudopanscopus Hatch, 1971:287 (not Buchanan).

Derivation of the name –The Greek word *Panscopus* means "all-seeing" (Blatchley and Leng 1916: 103).

Diagnosis .– Adults of this genus are distinguished by the following suite of characters: Broad-nosed weevils with mandibular scar as evidence of the presence of mandibular cusps in teneral adults; proepisternum obliterated, or nearly so, over most of its length; setae on prementum one pair, or absent; elytral intervals with serial pits, each pit with a scale therein, in most species the scale larger than scales of the surrounding vestiture.

Included species .– Twenty-seven species are included in the genus. Each one is discussed in some detail below.

Phylogenetic relationships .– In the reconstructed phylogeny (Fig. 78) *Panscopus* is the adelphotaxon of a clade of genera including *Amphidees, Paranametis, Lepesoma, Tropiphorus* and *Phyxelis* . *Panscopus* is a monophyletic assemblage, based on the apotypic oval or round scale in each serial elytral pit and the reduced number of setae on the prementum.

Key to subgenera and species of adults of *Panscopus*

1. a) Pronotum without median longitudinal sulcus; prementum with pair of setae on ventral surface, setae situated near apical margin; .....subgenus *Parapanscopus* 2

   b) Pronotum dorsally with median longitudinal sulcus narrow and shallow, deep and distinct, or slight depression in anterior half; prementum withor without setae.....3

2. (1a) a) Antennal scape vestiture of setae which do not cover the integument.....*P. maculosus* Blatchley, p. 41.

   b) Antennal scape with thin setae and apressed scales, integument nearly completely covered apically; prothorax wider, the sides markedly rounded.....*P. ovatipennis* Buchanan, p. 45.

3. (1b) a) Pair of setae on ventral surface of prementum, 1/3 to 1/2 posteriad anterior margin; elytral humeral angles sinuous, intervals 7 & 9 convergent anteriorly short distance distad anterior margin of elytron. ..... *Panscopus s.s.* 4

b) Prementum glabrous, without setae on ventral surface. Western North American species 6

4. (3a) a) Each serial elytra pit with hair or elongate, thin flat scale; alternate intervals costate and setose, even intervals with either sparse irregular row of setae or nearly non-setose; corbellary plate at apex of tibia 3 effaced ..... *P. alternatus* Schaeffer, p. 51.

b) Each serial pit with oblong to round scale; corbellary plate indistinct 5

5. (4b) a) All elytral intervals setose; lateral margins of pronotum, in dorsal view, evenly, gently curved convexly ..... *P. erinaceus* Say, p. 54.

b) Alternate elytral intervals costate and setose, even intervals non-setose, or nearly so; lateral margins of pronotum, in dorsal view, markedly curved convexly ..... *P. impressus* Pierce, p. 60.

6. (3b) a) Median longitudinal sulcus of pronotum broad and deep; metepisternal suture fine its entire length; elytral setae broad, flat and scale-like ..... subgenus *Pseudopanscopus* Buchanan....7

b) Median sulcus of pronotum various: complete, or reduced to depression in anterior half, not broad and deep. Metepisternal suture obliterated over most of its length, visible or not in posterior quarter opposite coxa 3; setae of dorsum of elytra decumbent; females with pair of crescent-shaped sclerites in bursa copulatrix ..... (*Dolichonotus* +*Phymatinus* +*Nomidus*) 8

7. (6a) a) Alternate elytral intervals in form of continuous costae the length of elytra ..... *P. costatus* Buchanan, p. 68.

b) Elytral costae discontinuous, in form of discrete tubercles, or ridges, each with a clump of broad, flat, blunt scale-like setae ..... *P. capizzii* Hatch, p. 71.

8. (6b) a) Scape long, extended nearly to or beyond hind margin of eye,or if only extended to middle of eye, then pronotum and elytra with large shiny round tubercles (*P. gemmatus*) ..... (*Dolichonotus* +*Phymatinus*)....9

b) Scape relatively short, extended only to anterior margin, or to middle, of eye; other characters various ..... subgenus *Nocheles* Casey....15

9. (8a) a) Females with 4 abdominal sterna visible (6 and 7 fused) , or if with 5 visible sterna, then elytra and pronotum with shiny tubercles; apex of aedeagus of males extended into a broad, dorso-ventrally flattened projection; pronotum wider than long ..... subgenus *Phymatinus* LeConte....12

b) Abdomen of both sexes with 5 sterna (3-7) visible, and densely scaly-setose; pronotum as long as, or very nearly as long as wide, in dorsal view.....subgenus *Dolichonotus* Buchanan..10

10. (8b) a) Fifth abdominal sternum nearly as long as broad, hind tibia broadly emarginate on ventral margin; pronotum widest at midpoint, from anterior to posterior .....*P. oregonensis* Buchanan, p. 80.

b) Fifth abdominal sternum 1/2 to 2/3 as long as broad, hind tibia nearly straight, its mucro subacute at tip; pronotum widest anterior of middle..... 11

11. (10b) a) Alternate elytral intervals raised and costate, even intervals completely or nearly non-setose; setae of alternate intervals blunt-ended and slightly broadened and flattened .....*P. convergens* Buchanan, p. 75.

b) Alternate elytral intervals not perceptibly more convex than even intervals; all elytral intervals with one or more rows of setae, elytral setae thin and acute..... *P. acutisetus,* new species p. 82.

12. (9a) a) Pronotal and elytral surface with raised round shiny black tubercles, each with seta at apex; body vestiture of dense overlapping scales, when viewed under magnification, shiny metallic green or cupreous; females with 5 visible abdominal sterna; large weevils, 8-12 mm long. .....*P. gemmatus* (LeC.). p. 85.

b) Females with only 4 visible abdominal sterna; field of spicules visible in internal sac of cleared male specimens, distad to belt of tegmen; V-shaped pair of sclerites present in internal sac of males..... 13

13. (12b) a) Alternate elytral intervals distinctly costate; elytral setae thin, but flattened, even intervals nearly non-setose; colour black to cinereous.....*P. longiscapus* , new species p. 95.

b) Elytral intervals even, or at most slightly elevated near base 14

14. (13b) a) Elytral declivity, in lateral view, in form of straight line and slightly reflexed; elytral setae more appressed than decumbent, from broad and scale-like, to thin, but flattened; colour, in most specimens, cinereous..... *P. squamosus* Pierce, p. 100.

b) Elytral declivity, in lateral view, in form of continuous curve to apex; elytral setae more decumbent than appressed; setae thin but flattened; colour black, or nearly so.....*P. michelbacheri* Ting, 104.

15. (8b) a) Elytral intervals flat or subequally convex; setae slender and acute or nearly acute at apex, about equally distributed on all intervals; pronotum smooth, or rugose tuberculate 16

b) Alternate elytral intervals elevated (slightly so in some specimens); elytral setae more numerous on alternate intervals; elytral setae flattened and blunt-ended (except in *longus*); pronotum more or less rugose-tuberculate, not smooth..... 17

16. (15a) a) Pronotal tubercles visible among scales; pronotal surface rugose; longitudinal sulcus slightly developed; colour grey, or grey mottled with brown; body size medium, 6.5-9 mm in length ..... *P. aequalis* (Horn), p. 147.

b) Pronotal surface smooth, or nearly so and covered in appressed scales; median longitudinal sulcus only faintly indicated; body size smaller, 5-6.5 mm in length..... *P. squamifrons* Pierce, p. 156.

17. (15b) a) Rostrum slender, with thin median longitudinal carina; alternate elytral intervals costate, males complex 3-part acute angular complex of sclerites in internal sac (*johnsoni* , Fig. 64) or with pair of v-shaped sclerites and field of fine denticles visible in un-everted internal sac, anterior (proximal) to belt of tegmen (Fig. 65) 18

b) Rostrum usually stouter; male internal sac without field of spicules 19

18. (17a) a) Dorsal scales, at least in part, green; alternate elytral intervals costate; scape setose only; rostrum slender, with thin median longitudinal carina..... *P. johnsoni* Van Dyke, p. 108.

b) Dorsal scales not green; scape setose and squamose, the integument completely covered, or nearly so ..... *P. bakeri* Buchanan, p. 111.

19. (17b) a) Rostrum unicarinate or tricarinate on dorsal surface; hind tibia nearly straight, its lower edge with setae only (except in some specimens of *tricarinatus*) 20

b) Rostrum feebly unicarinate or non-carinate; tibia 3 slightly bent, its lower edge broadly and feebly convex in profile and with some coarse brown or blackish spines 22

20. (19a) a) Even elytral intervals nearly or quite non-setose; prothorax widest at middle; rostrum emphatically tricarinate..... *P. ovalis* Pierce, p. 128.

b) All elytral intervals setose..... 21

21. (20b) a) Prothorax widest in front of middle; rostral carinae somewhat reduced, in some specimens carinae barely visible through vestiture, appearing unicarinate ..... *P. torpidus* (LeC.), p. 118.

b) Prothorax widest about middle; rostrum with three visible carinae ..... *P. tricarinatus* Buchanan, p. 132.

22. (19b) a) Prementum with a indistinct median carina on apical 1/2 to 1/3..... 23

b) Prementum smooth, without median carina 24

23. (22a) a) Colour brownish black; even elytral intervals non-setose; apical declivity of elytra reflexed in lateral view ..... *P. abruptus* (Casey), p. 161.

b) Colour paler brown in most specimens; even elytral intervals setose their entire length; pronotal rugosities coarser ..... *P. rugicollis* Buchanan, p. 168.

24. (22b) a) Even elytral intervals flat, and non-setose for most of their length, alternate elytral intervals at least slightly elevated, and with double or triple rows of setae 25

b) Elytral intervals subequally convex, alternate intervals only slightly elevated near base of elytra; even intervals with a row of setae their entire length 26

25. (24a) a) Clump of 6-10 flattened, scale-like, in many specimens light buff-coloured setae visible supra-orbitally.. *P. schwarzi* Van Dyke, p. 140.

b) Without clump of supra-orbital setae, setaediffuse over frons and rostrum; setae less flattened and in most specimens brown in colour ..... *P. coloradensis* Van Dyke, p. 144.

26. (24b) a) Elytral setae flat, blunt and decumbent..... *P. bufo* Buchanan, p. 136.

b) Elytral setae thin, acute and semi-erect.. *P. longus* Buchanan, p. 115.

Subgenus *Parapanscopus* Buchanan

Parapanscopus Buchanan 1936: 5. Type species: *Panscopus maculosus* Blatchley, by original designation. Blackwelder 1939:66. Kissinger 1964:36.

Derivation of name .— From the Greek word *para* , beside, or near, plus *Panscopus,* to give "near *Panscopus* ".

Diagnosis .— Representatives of this subgenus exhibit a pair of setae on the ventral surface of the prementum, located near the anterior margin of the prementum, and have no median longitudinal sulcus evident on the pronotum.

Included species .— *P. maculosus* Blatchley and *P. ovatipennis* Buchanan.

Phylogenetic relationships .— This subgenus is the oldest lineage to diverge from the lineage which ultimately gave rise to all of the other species of the genus.

Panscopus (Parapanscopus) maculosus Blatchley
(Map 1, Figs. 1 and 27)

Panscopus maculosus Blatchley 1916:105; O'Brien and Wibmer, 1982-63

Panscopus (Panscopus) maculosus . Leng 1920:312. Schenkling and Marshall 1931-40

Panscopus (Parapanscopus) maculosus , Buchanan 1936-6. Blackwelder 1939:66.

Type material .— Holotype ♀ : "TYPE (red label); Posey Co./ Ind. W.S.B./ 4-14-04; Purdue/ Blatchley/ Collection" (PURC)

Notes about synonymy .— Blatchley (1916), when he described *P. maculosus*, placed it in the genus *Panscopus* without placing it in a subgenus, even though he was aware that Pierce (1913) had classified the 13 species of *Panscopus* known at that time in five subgenera. Leng (1920) and Schenkling and Marshall (1931) classified the species in the subgenus *Panscopus sensu stricto*, recognizing Pierce's (1913) subgeneric groupings.

Buchanan (1936) subdivided further *Panscopus sens. str.*, placing *P. maculosus* and *P. ovatipennis* in the subgenus *Parapanscopus* .

Derivation of specific epithet .— The Latin word *maculosus* means dappled, or spotted. This refers to the dappled or mottled appearance of the dorsal integument of this weevil.

Diagnosis .— A pair of setae inserted near the anterior margin on the ventral face of the prementum, lack of a median longitudinal sulcus on the rostrum, antennal scape with a vestiture of fine setae which do not cover the integument, and the mottled or blotchy pattern of slightly lighter and darker setae on the dorsum of the beetle distinguish specimens of *P. maculosus* from other species of *Panscopus* .

Description .— Size: ♀♀ : length, 6.2-8.3 mm (mean=7.5, n=15); width at widest point of elytra, 2.9-3.9 mm (mean=3.4, n=15) (other measurements, see Table 1); Head : broad, shallow lateral concavity between frons and rostrum, frons and rostrum discontinuous in lateral view; setae not even in distribution-clumps of seven to 10 setae on frons, supra-orbitally; antennal scape with vestiture of setae not obscuring integument; scape extending to middle of eye when next to rostrum. Pronotum : wider than long, evenly convex over dorsum, broadly rounded, laterally, in dorsal view, surface uneven, round or polygonal raised areas, each with seta at centre, many with indistinct ring of flat scales around seta; median longitudinal carina absent, line of paler coloured scales, slightly cupreous in colour, medially, extended length of pronotum; broad irregular band of pale-coloured scales longitudinally on lateral margins of elytra at point of greatest convexity in dorsal-ventral dimension; sutural intervals slightly raised, other intervals subequally convex, each with row of thin, acute, decumbent setae; partly double row on odd-numbered intervals; scales of serial punctures obvious, round and slightly larger than other scales; surface vestiture of nearly round, dense overlapping scales in contrasting pattern of brown with patches of pale-coloured scales on disc of elytron, at humeral angles and along sutural interval. Legs : spines of ventro-lateral edge of tibiae 1 and 2 not pronounced, but pale coloured, as are other setae on tibiae, but longer than other setae; tibia 3 with small mucro at apex, corbellar area enclosed. Abdomen: five sterna visible in females and males; sterna 1 and 2 convex at middle in females, ventral surface with dense vestiture of flat, round, appressed scales, and thin decumbent, and semi-erect setae. Genitalia: ♀♀ :(Figs. 1, 27) tergum 8 broadly convex dorsally and somewhat conical in shape, sternum 8 (spiculum ventrale) broadly spade-shaped in apical portion, convex ventrally, and rounded at apices, cleft medially in apical part, with very fine short setae posteriorly; apical expansion of spiculum approximately 2/5 length of spiculum; coxites angular, narrowed apically in dorsal view, rounded apically in lateral view ; styli each with two or three obvious setae apically, additional shorter setae visible at higher magnification; bursa copulatrix short, joined to common oviduct short distance from basal margin of coxites; bursa without sclerotized structures internally.

Life History Data .— Females have been collected in the months April to July, with most specimen labels bearing dates in the months of May and June. This suggests that adults are active in spring and early summer. Other than

this, nothing is known of the life history of these weevils. I have not seen males of this species.

Host Plant Associations .— Blatchley (1916) reported having taken specimens from bitter-sweet (*Celastrus scandens L.*) No other host plant information has been reported, and I have seen no such information on specimen labels.

Geographical distribution .— This species is known from the eastern United States, principally west of the Appalachian Mountains (Map 1).

Phylogenetic relationships — P. maculosus is the postulated adelphotaxon of *P. ovatipennis* (Fig. 79).

Material Examined .— In addition to the holotype, 28 specimens were examined.
UNITED STATES OF AMERICA:
Iowa: Boone Co.: Ledges State Park,25-Jun-49,S. Sparling, 1,(ISUI); Johnson Co.: Iowa City,May-30,Wickham,4,(USNM), 1,(CNCI); Storey Co.: Ames,22-Jun-25,G.H., 1,(ISUI); "Wahoo, Ames",?-35,?,1,(ISUI); Ames,7-Jul-26,L.M.Harris,1,(ISUI); Ames,13-Jun-30,L.E.Hiner,1,(ISUI); Ames,16-May-48,Browning,1,(ISUI); Illinois: Hardin Co.: Elizabethtown,27-May-32,H. L. Dozier,1,(INHS); Union Co.: 8 km N Wolf Lake,13-Jun-61,W.L.Downes,1,(AMNH); Indiana: Lake Co.: Lake Station,21-Apr-07,E. Liljeblad,1,(UMAA); Posey Co.: 5.6.03,Purdue Blatchley Colln,[Paratype material?],1,(PURC); Posey Co.,W. S. B.,19-Apr-04,Blatchley coll'n,1,(CWOB); Posey Co.,"W.S.B." "COTYPE",19-Apr-07,H. C. Fall colln.,1,(MCZC); Tippecanoe Co.: ?,6-Jun-70,N. M. Downie,1,(NMDC); Tippecanoe Co. ,4-Jul-65,N. M. Downie,1,(NMDC); Tippecanoe Co. ,4-May-79,N. M. Downie,1,(NMDC); Tippecanoe Co.,14-?-53,N. M. Downie,1,(NMDC); Kentucky: Christian Co.: 21-Jun-61,J.M.Campbell,1,(USNM); Jefferson Co.: Louiseville,2-Jun-?,H.Soltau Collection,1,(USNM); Louiseville,22-Jun-1890,H.Soltau Collection,1,(USNM); Todd Co.: ?,18-Apr-64,T. C. Barr,1,(MCZC); Ohio: Hamilton Co.: Cincinnati,9-Jul-1893,H. Soltau collection,1,(USNM); Cincinnati,25-Jun-1892,H. Soltau collection,1,(USNM); Cincinnati,23-May-23,H.W. Wenzel coll'n,1,(OSUC); "Col.",?,?,1,(ISUI).

Panscopus (Parapanscopus) ovatipennis Buchanan
(Map 1, Figs. 2, 28, 53, 74)

Panscopus (Parapanscopus) ovatipennis Buchanan 1936: 6. Blackwelder 1939:66.

Panscopus ovatipennis . O'Brien and Wibmer, 1982: 63.

Panscopus (Parapanscopus) verrucosus Buchanan 1936:7. **new synonymy.**

Panscopus ovatipennis verrucosus . Blackwelder 1939:66. O'Brien and Wibmer, 1982: 63.

Type material .— Holotype of *P. ovatipennis* Buchanan: ♀ (USNM Type No. 50646) Hamilton, Canada (no date or collector indicated). Also the holotype of *P. verrucosus* Buchanan was examined: Rockville Pa. III-13-09, Coll. by Kirk and Champlain (USNM Type No. 50832).

Notes about synonymy .— Buchanan (1936) described *P. verrucosus* based on specimens in which the pronotal tubercles are slightly more isolated, and the intermediate segments of the funicle are slightly shorter. This variation is within that to be found among specimens of *P. ovatipennis* .

Derivation of specific epithet .— *Ovatis* L. means egg-shaped; *pennis* could come from the Latin root *penna*, meaning feather, wing, arrow, or pen. This could be in reference to the oval, or egg-shaped elytra.

Diagnosis .— A pair of setae on the ventral surface of the prementum, situated near the anterior margin distinguish specimens of *P. maculosus* and *P. ovatipennis* from other species of *Panscopus* . *P. ovatipennis* is distinguished by the vestiture of setae and scales on the scape, nearly concealing the integument, the wide prothorax with markedly rounded lateral margins, and pronotal tubercles shaped as flat, round or polygonal raised areas, each with a ring of scales, and a seta at the middle.

Description .— Size: ♀♀ : Length, 6.1mm, width, 2.9-3.1 mm (n=2); ♂ : (n=1) length, 5.1 mm (estimated from specimen with missing head), width, 2.2mm (other measurements, see Table 2). Head: broad transverse depression between eyes, frons and rostrum apparently discontinuous in lateral view; frons with dark pit, or short narrow, longitudinal sulcus medially, between eyes; rostrum with broad, pronounced median longitudinal carina dorsally and with lower, less pronounced lateral longitudinal carinae , one each side; angular nasal plate indistinct, merged with punctate region near apex of rostrum, vestiture of head and rostrum dense, appressed, scales, with two indistinct rows of semi-erect setae each side of middle, supra-orbital setae scattered, not in form of dense clump above eye. Antennae: scape clothed from near base to apex with thin decumbent setae and appressed scales, scales seta-like and sparse basally, broader more scale-like and nearly hiding integument near apex; funicular annuli elongate, 7 obviously longer than broad. Pronotum: wider than long, widest at about middle, broader posteriorly than anteriorly, without median longitudinal sulcus, dorsally with polygonal raised areas, each with a ring of 5-8 flat appressed scales and seta-bearing puncture at centre. Elytra: longer than wide, together wider than prothorax, lateral margins convergent gradually from middle toward apex; apical declivity, in lateral view, straight near apex and reflexed; intervals subequally slightly convex, 3 and 5 slightly elevated near basal margin, each interval with single row of thin, semi-erect setae; surface vestiture of dense, flat, appressed scales covering integument, in irregular pattern of pale tan coloured, cupreous and brown, surface mottled. Legs: tibia 1 with few short small denticles on ventro-lateral margin, apically: femora and tibiae with dense vestiture of flat scales, nearly obscuring integument, and sparse decumbent setae: tibia 3 with corbellar area closed, enclosed area glabrous. Abdomen: five sterna (3-7) visible in both males and females; vestiture of densely spaced, appressed, overlapping scales nearly hiding integument; sterna 1 and 2 convex at middle in females; in males sternum 1 concave at middle, sternum 2 nearly flat or with slight concavity.

Genitalia: ♀♀ : (Figs. 2, 28) tergum 8 broadly convex dorsally, somewhat conical in shape and angled toward rounded apex; sternum 8 (spiculum ventrale) apical expansion broadly spade-shaped , convex ventrally, rounded at apices, cleft medially in apical portion, with fine setae apically; coxites 1 and

2 broadly angular in dorsal view, rounded at apex in lateral view, styli with three or four setae apically, bursa copulatrix shorter than coxites, membranous, without sclerites internally; spermatheca sickle-shaped, broad, and tubular in cross-section, pointed at apex, with fine rugae laterally in inside of curve; ♂ ♂ : (Figs. 53, 74) aedeagus with median lobe decurved, concave ventrally; apex broadly rounded in dorsal or ventral view, manubrium of tegmen slightly longer than median lobe; median struts of aedeagus 2/3 longer than median lobe, internal sac membranous with sclerites comprised of median flagellum-like structure curved ventrally, and pair of lateral lobes, loosely connected to base of flagellum, located apically in sac (anteriorly , in un-everted sac); apical portion of spiculum gastrale with tubular, sclerotized structure projected apically.

Life History Data .— The few adults known were collected in the months of March, May ,and June.

Host plant associations .— No host plant information is available regarding specimens of this species.

Geographical distribution .— This species is known from eastern North America, from southern Ontario southward to southern North Carolina (Map 1).

Phylogenetic relationships .— *P. ovatipennis* is the postulated adelphotaxon of *P. maculosus* (Fig. 79).

Chorological affinities .— The ranges of this species and *P. maculosus* are adjacent and non-overlapping (Map 1).

Material examined .— In addition to the holotype, six specimens were examined.
UNITED STATES OF AMERICA:
Maryland: Bear Island, W. of DC,C&O Canal, 6-Jun-71, Gary F. Hevel, 1.(USNM); North Carolina: Cherokee Co.: Hiwassee Dam,20-23-May-61,?,1,(CWOB); Virginia: Montgomery Co.: Blacksburg,25-May-47,C.L.Perkins,1,(USNM); Washington Co.: Sugar Hollow Rec. Area nr Bristol,17-Jun-84,W.Maddison,1,(RSAN); West Virginia: Fayette Co.: Clifftop, Babcock S.P.,14-May-21-Aug-83,S.&J. Peck,2,(HAHC);

Subgenus *Panscopus* Schönherr

Panscopus Schönherr 1842:266. Gender masculine. Type species *Barynotus erinaceus* Say 1831 (=*Panscopus (Panscopus) erinaceus* (Say)), by original designation (Schönherr, 1842:267). Gemminger and Harold 1871:2307. Horn 1876:42. LeConte and Horn 1883:444.

(Panscopus) . Pierce 1913:390. Blatchley and Leng 1916:103. (Leng, 1920):312. Buchanan 1927, 1936. Schenkling and Marshall 1931:39. Blackwelder 1939 :66. Kissinger 1964:36. Hatch 1971:288. O'Brien and Wibmer 1982:63.

Derivation of name .—This is the type subgenus of the genus *Panscopus*.

Diagnosis .— A pair of setae on the ventral surface of the prementum, inserted one-third to one-half way posteriad the anterior margin, and the sinuous elytral humeral angles in dorsal view resulting from the convergence of intervals 7 and 9 a short distance distad the anterior margin of the elytron

distinguish representatives of this subgenus from those of all other taxa of *Panscopus sensu lat.*.

Included species .— *P. alternatus, P. erinaceus,* and *P. impressus* .

Phylogenetic relationships .— This lineage is hypothesized to have been derived early in the evolutionary history of the genus. It is the second line, after *Parapanscopus* to arise, near the base of the phylogeny, diverging from the lineage which ultimately gave rise to the remaining species of the genus.

Panscopus (Panscopus) alternatus Schaeffer
(Map 2, Figs. 3, 29, 54)

Panscopus alternatus Schaeffer#936}1908:214. Blatchley, 1916:105. O'Brien and Wibmer, 1982:62.

Panscopus (Panscopus) alternatus . Pierce 1913:391. Leng 1920:312. Buchanan 1927:27. Schenkling and Marshall, 1931:40. Buchanan 1936:3. Blackwelder 1939:66.

Type material .— ♂ (USNM Cotype No. 42481) Black Mount. N.C. IX.13 Brooklyn Museum Coll. 1929.

Derivation of specific epithet .— The specific epithet is derived from the Latin *alternus*, meaning first one, then the other, alternating, plus the suffix *-atus* to make an adjective which was no doubt intended to describe the alternating elevated, or slightly keeled, and flat elytral intervals exhibited by this species, as well as some other species in the genus.

Diagnosis .— *Panscopus s. s.* weevils with alternate elytral intervals costate and setose, even intervals incompletely setose or nearly without setae, scales of serial punctures on elytra narrow, almost seta-like on lateral portions of elytra, and corbel of tibia 3 effaced.

Description .— Size: ♀♀ : Length 6.4-7.9 mm (n=6), width across elytra 2.8-3.4mm (n=8); ♂♂ : Length 6.0-7.3 mm (n=10), width across elytra 2.3-2.6 mm (n=12) (other measurements, see Table 3). Head: broad transverse impression immediately in front of eyes between frons and rostrum, rostrum tricarinate dorsally, with pronounced medial longitudinal carina, and lateral longitudinal carinae, one on each side, visible through vestiture of dense appressed scales and sparse semi-erect setae, rostral carina less pronounced in males, angular nasal plate indistinct, merged with punctate region near apex of rostrum. Antennae: scape clothed with appressed scales and decumbent setae , together nearly obscuring integument over most of its length; funicular annuli slightly elongate, 7 obviously longer than broad. Pronotum: slightly wider than long, widest slightly in front of middle; median longitudinal sulcus present, dorsal surface irregularly rugose-tuberculate, vestiture of irregular layer of apressed scales and irregular, sparsely distributed semi-erect to decumbent setae. Elytra: approximately one-half longer than combined width, together slightly wider than prothorax, parallel-sided at middle third, in dorsal view, narrowed in curve toward apex; declivity, in lateral view, evenly curved toward apex; alternate elytral intervals raised, carinate, even intervals nearly flat, alternate (raised) intervals with irregular double row of decumbent, thin setae; even intervals with incomplete single row of setae, serial punctures each with

thin, short seta, not a scale; surface vestiture of dense appressed scales obscuring most of integument, scales brown to beige, some cupreous. Legs : tibia 1 with row of denticles on ventral margin in apical third, setae inserted therein thin and hair-like, not stout spines; tibiae 2 and 3 without denticles or stout spines; femora and tibiae with dense vestiture of flat scales, nearly obscuring integument, and sparse decumbent setae; tibia 3 with corbellar area open, not enclosed by curved comb of blunt short setae. Abdomen : five sterna visible in both males and females, vestiture of discontinuous layer of appressed scales and scattered decumbent setae, integument visible among scales and setae; sterna 1 and 2 convex at middle in females, in males sternum 1 concave at middle, sternum 2 nearly flat or with slight concavity. Genitalia : ♀♀ : (Figs. 3, 29) tergum 8 broadly convex dorsally, somewhat conical in shape, narrowing toward rounded apex; sternum 8 (spiculum ventrale) with apical expansion broadly spade-shaped , convex ventrally, rounded at apices, cleft medially in apical portion, with fine setae apically; coxites 1 and 2 narrowly angular in dorsal or ventral view, rounded toward apex in lateral view; styli with two or three primary setae at apex; bursa copulatrix slightly longer than coxites, membranous, without sclerotized structures therein; spermatheca sickle shaped, tubular in cross-section,very thin.

♂♂ : (Fig. 54) aedeagus with median lobe gently decurved, concave ventrally, apex broadly rounded in dorsal or ventral view, manubrium of tegmen slightly longer than median lobe; median struts of aedeagus ~ 1.6X length of median lobe, internal sac membranous, with 10 to 12 sclerotized denticles visible in apical portion (anterior portion in inverted sac).

Life History Data .— Adults have been collected in the months of May, June, July, August and September.

Host plant associations .— One specimen from the Mt. Mitchell area of North Carolina was taken from *Prunus* sp. (CWOB) and four others were reported from litter under *Rhododendron* (CWOB).

Geographical distribution .— This species occurs in the southern Appalachian region of eastern North America, in the western parts of North Carolina and South Carolina at altitudes between 1,220 and 1,980 metres (Map 2).

Phylogenetic relationships .— *P. alternatus* is the postulated adelphotaxon of the ancestor of the *P. erinaceus* - *P. impressus* species pair (Fig. 79).

Chorological affinities .— The range of this species is overlapped by the combined ranges of the *P. erinaceus–P. impressus* species pair (Maps 2 and 3).

Material examined .— In addition to the holotype, 31 specimens were examined.

UNITED STATES OF AMERICA:

Indiana: Wayne Co.,?,?,H. Winter,1,(USNM); North Carolina: Jackson Co: Balsam. Yellow Face 1768m, 25-Jun-71,W. Rosenberg, 3,(USNM); Blue Ridge Parkway Yellow Face 1768m, 4-Aug-72,W.Rosenberg coll'n,1,(USNM); Blue Ridge Parkway Yellow Face 1768m, 22-Jun-73,Rosenberg coll'n,2,(USNM); Cullowhee, Cane Ck., 5-25-Jun-1984, Rip., S. Marshall, 1 (RSAN); Yancey Co.:

Black Mtns.., Mt. Mitchell ,12-Jun-27,Quirsfeld,1,(USNM); Black Mtns., Mt. Mitchell ,17-Jun-27,Quirsfeld,1,(USNM); Black Mtns., Mt. Mitchell ,?,?,1,(USNM); Mt. Mitchell,31-May-73,W.R.Suter,Litter under Rhododendron, 4,(CWOB); Mt. Mitchell 1220-1830 m, Jun-39,Quirsfeld,1,(CNCI); Mt. Mitchell 1520-2040 m, ,A.Nicolay,13-Jun-27,2,(USNM), 1,(CNCI); 15-Jun-27,2, (USNM), 1,(CASC); 16-Jun-27,1,(USNM); Mt. Mitchell 1980 m,E. Shoemaker:,18-Jun-37,1,(USNM); 26-Jun-37,1,(USNM); Cotype No.424-81 USNM Black Mtn.,13-Sep,?,1,(USNM); Mt. Mitchell 1980 m,1-Jul-65,L. & C. W. O'Brien,*Prunus*,1,(CWOB); Mt. Mitchell ,12-Jun-73,W. R. Suter,Litter at log,3,(CWOB); Mt. Gibbs,28-Jun-37,E. Shoemaker,1,(USNM).

Panscopus (Panscopus) erinaceus (Say)
(Map 3, Figs. 4, 30)

Barynotus erinaceus Say 1831:11

Panscopus erinaceus (Say) Schönherr 1842:267. LeConte and Horn, 1876:42. Blatchley, 1916:104. O'Brien and Wibmer, 1982:63

Panscopus (Panscopus) erinaceus . Pierce, 1913:393. Leng 1920:312. Schenkling and Marshall, 1931:40. Buchanan, 1927:27, 1936:4. Blackwelder 1939:66.

Panscopus carinatus Pierce 1913: 398

Type material .— Types have not ben seen and are presumed lost with Say's collection. Say (1831) made no mention of type specimens or of a type locality.

I have examined also the following type material of *Panscopus carinatus* Pierce (USNM): Holotype: "Detroit/ Mich; Coll Hubbard/ & Schwarz; Type/ No. 14695/ U.S.N.M.; Panscopus / carinatus / Type Pierce" ; One paratype, also from Detroit, Mich., Hubbard and Schwarz colln., bearing the U.S.N.M no. 14645

Derivation of specific epithet .— "*Erinaceus* " is the Latin word for hedgehog, presumably referring to the spiny appearance of this weevil, due to the stout erect setae on the dorsum.

Diagnosis .— A pair of setae inserted on the ventral surface of prementum one-half to one-third of the way posteriad the anterior margin of the prementum; sinuous humeral angles with intervals 7 and 9 coalescing a short distance distad the anterior margin of the elytron; and all elytral intervals setose, distinguish adult specimens as members of this species.

Description .— Size: ♀♀ : Length 6.6-9 mm (n=10), width across elytra 2.9-3.5 mm (n=10); (other measurements, Table 4) (males unknown). Head : pronounced, broad, transverse concavity on frons between eyes, between rostrum and frons; rostrum unicarinate, median longitudinal carina pronounced, but rounded, and covered with vestiture; angular nasal plate large and obvious, not clearly delimited, merged with punctate region near apex of rostrum; vestiture on rostrum and frons of dense, appressed, overlapping scales, sparse rows of decumbent, slightly flattened setae, each side on rostrum, sparse, scattered setae on frons, and loose groups of 10-12 such setae supra-orbitally. Antennae: scape extended to anterior third of eye, scape vestiture of appressed striate scales and decumbent setae obscuring integument over most of surface,

funicular annuli with sparse decumbent setae, no scales, shiny rufous integument clearly visible; annulus 7 longer than broad. Pronotum: one third to one quarter wider than long; median longitudinal sulcus present in most individuals, narrow, shallow , in some specimens highlighted by narrow, irregular longitudinal line of lighter coloured scales; dorsal surface irregularly rugose-tuberculate, tubercles covered by vestiture; vestiture of dense overlapping appressed scales, and scattered decumbent setae, the setae inserted on local topographically high points of surface; Elytra: approximately one-half longer than combined width, together slightly wider than prothorax, broadly oval-shaped,declivity rounded, in lateral view and sightly reflexed at postero-ventral apex; intervals slightly convex, odd-numbered intervals slightly elevated over even intervals; row of setae present on all intervals, in most specimens, in some, even intervals with discontinuous row, or few setae near base, and near declivity; serial punctures each with round, or broadly oval scale, surface vestiture of dense overlapping, appressed, striate, nearly round scales, and rows of decumbent to semi-erect setae; scales beige to brown in colour. Legs : tibiae 1, 2, and 3 with row of four to five amber-coloured spines on ventro-medial margin in apical half, femora and tibiae with dense vestiture of overlapping scales, and scattered, decumbent setae; apex of tibia 3 with corbellar area very narrow, indistinctly delimited from lateral surface of tibia. Abdomen: five sterna (3 to 7) visible in females (males unknown), vestiture of continuous layer of appressed scales, and scattered, decumbent setae; Genitalia: ♀♀ : (Figs. 4, 30) tergum 8 broadly convex dorsally, rounded apically, sternum 8 (spiculum ventrale) with apical expansion broad and slightly convex ventrally, rounded at apices, cleft medially in apical third, with fine setae apically, directed postero-ventrally, coxites 1 and 2 angular in dorsal view, narrowed apically, styli with three or four fine setae apically, bursa copulatrix membranous, no sclerotized structures internally, dorsally with lightly sclerotized, rounded plate forming dorsal wall of bursa; spermatheca slightly scythe-shaped, thin and tapered, acute apically.

Life History Data .— Adult females have been collected in the months of May, June, July, August, September, October and November. Males are unknown.

Host plant associations .— One specimen bears a label indicating it was taken from *Rubus* (CNCI). The species also has been reported to have been collected from wild grape (Blatchley and Leng 1916).

Geographical distribution .— This species occurs in eastern North America from Minnesota and Ontario in the west, eastward to the Atlantic coast and south to southern West Virginia (Map 3).

Phylogenetic relationships .— *P. erinaceus* is the postulated adelphotaxon of *P. impressus* (Fig. 79).

Chorological affinities .— The ranges of this species and *P. impressus* are adjacent to one another and non-overlapping (Map 3).

Material examined .— In addition to the holotype, approximately 155 specimens were examined.
CANADA:
Ontario: Essex Co.: Leamington,14-Jun-40,W.J.Brown,1,(CNCI);

Prince Edward Co.: ?,5-Jun-38,Brimley,4,(UCDC), ?,10-May-36,Brimley,4,(UCDC);?Brimley,11-Jul-26,?Brimley,1,(CWOB); 26-Jul-45,J.C.Brimley,1,(AMNH); 5-Jun-38,J.C.B.,2,(AMNH);J.F.Brimley coll'n:17-May-14,1; 20-Jul-19,1; 24-Jun-25, 1: 28-Jun-25, 1;18-Jul-26, 1; 31-Jul-27, 1; 7-May-33, 1; 21-May-48, 3; 13-Jul-30, 1; 29-Jul-17, 1; no date, 2; (CNCI); Prince Edward Co.,?,J. F. Brimley, 1,(JLCC); Regional Municipality of Ottawa-Carleton, "Ott.", 11-Jul-14, ?, *Rubus* 1, (CNCI); Jockvale,3-Jun-43,W.J.Brown,1,(CNCI); Renfrew Co.: Chalk River,23-Aug-36,?, 1 ,(CNCI); Quebec: Gatineau Park,Harrington Lake,20-Jun-54,J.E.H.Martin,1,(CNCI);

UNITED STATES OF AMERICA:

Connecticut: New Haven Co.: Prospect,17-Aug-72,C.W.O'Brien,at night,1,(CWOB); Prospect,16-Sep-66,C.W.O'Brien,1,(CWOB); Prospect,12-Sep-66,C. W. O'Brien,2,(CWOB); Prospect,16-Aug-76,C. W. O'Brien,at night, 1,(CWOB); Westville,18-Jun-04,W. E. Britton,1,(CAES); Litchfield Co.,Cornwall,17-Jul-21,M. P. Zappe,1,(CAES); District of Columbia: Washington,13-Jul,Hubbard&Schwarz,1,(USNM); Washington,19-Jun,Hubbard&Schwarz,1,(USNM); "D.C.",?,Stromberg coll'n,1,(INHS); "DC",ex Henry Ulke colln.,7,(CMNH); Illinois: ,"Ill",from Liebeck Colln,3,(CASC); Kentucky: no locality indicated, ex.: Henry Ulke coll'n., 2,(CMNH); Massachusetts: Essex Co.: H. Parker State For.,6&7-Sep-66,C. & L. O'Brien,1,(RHTC), 9,(CWOB); Hampden Co.: Montgomery,7-Jul-48,?,1,(USNM); Middlesex Co.: Framingham,3-Jun-?,C. A. Frost,1,(NMDC); Natick,?,C. A. Frost,1,(UCDC); Natick,15-Jun-41,?,1,(UMAA); Sherborn,5-Sep-38,C. A. Frost,1,(BMNH); Maryland: Plummer Island,Jun-22, 20-Mar-21, 8-Aug-05, 16-Jul-11, 24-Jun-08,H.S.Barber,5,(USNM); Plummers I.,"10.7.08",Barber & Schwarz,1,(PURC); Great Falls,?,?,1,(USNM); Michigan: Cheboygan Co.: Burt Lake State Park,9-Jun-69,L. &C.W. O'Brien,4,(CWOB), 1,(RSAN); Ingham Co.: E. Lansing,25-May,?,1,(CNCI); Livingston Co.: E.S. George Reserve,13-Nov-48,22-Jul-49,K.Bohnsack,2,(UMAA); Midland Co.: ?,4-Jun-37,R.R.Dreisbach,1,(USNM); Oakland Co.: ?,20-Jul-35,4-Jul-38,A. W. Andrews,2,(UMAA); Wayne Co.: [Paratype#14645 USNM *carinatus*] Detroit , Jun,Hubbard&Schwarz,1,(USNM); unknown county: "Mich.",Aug,?,2,(USNM); Minnesota: Hubbard Co.: Island Lake Area,14-July-1882,J.E. Wappes,1,(CWOB); New Hampshire: Rockingham Co.,Hampton,1-Jun-04,14-Apr-11,S.A.Shaw,2,(USNM); unknown county: "N.H.",?,through C.V.Riley,1,(USNM); New Jersey: Essex Co.: Cedar Grove,8-May-26,A. Nicolay,1,(USNM); Irvington,12-Apr,E.A.Bischoff,1,(CASC); Essex Co.: Newark,?,Liebeck collection,1,(CASC); Gloucester Co.: Woodbury,25-Mar,H.W. Wenzel coll'n,3,(OSUC); Morris Co.: Boonton,17-Apr-01,G.M.Greene coll'n,1,(USNM); unknown county: ?,"N.J.",?,R.Hopping coll'n,1,(CASC); "N.J.",?,F.Knab collection,1,(USNM); "N.J.",?,Brooklyn Mus. coll'n,1,(USNM); Ft. Spec,?,E. Shoemaker,1,(USNM); Orange Mtn.,?,E.A. Bischoff coll'n,1,(USNM); New York: Clinton Co.: Plattsburg,4-Jul-14,Shoemaker coll'n,1,(USNM); Erie Co.: Buffalo,Hubbard&Schwarz,,(USNM); Kings Co.,"Brooklyn, N.Y.",6-Jul-07,Shoemaker coll'n,1,(USNM); Niagara Co.: Olcott,4-Jul-25,H. Dietrich,1,(CUIC); Orange Co.: Ft. Montgomery,31-May-03,Blatchley Collection,1,(PURC); Queens Co.: "Aqueduct, Long Island",5-May-12,Shoemaker coll'n,1,(USNM); Flushing L. I.,?,K.Cooper,1,(OSUO); Suffolk Co.: Long Pond,29-Jun-24,?,1,(CUIC); Wading River LI,27-Jun-22,F. M.

Schott,1,(AMNH); Tompkins Co.: Ithaca,29-May-1894,?,1,(USNM); Westchester Co.: White Plains,26-Jul-25,JRTB,1,(FMNH); unknown counties: "N.Y.",?,Cas.W.Leng coll'n,1,(CUIC); "N.Y.",?,M.L.Linell coll'n,1,(USNM); N.Y. City vcty,?,?,2,(USNM), 1,(BMNH); N.Y. City vcty,?,H.Soltau coll'n,1,(USNM); NY,?,ex Henry Ulke colln.,1, (CMNH); N.Y. T.B.A.,1,(PURC); Ohio: Lucas Co.: Spencer T.,6-7-May-39,E.S.Thomas,1,(USNM);Pennsylvania: Dauphin Co.: ?, 21-Jun-28,J. N. Knull,1,(CASC); Monroe Co.: "Canadensis",8-Jul-27,Shoemaker collection,1,(USNM); Northampton Co.: Easton,8-Jul-17,J.W.Green,1,(CASC); Wind Gap,1-Jul-41,3-Jul-42,11-Jul-41,16-Jul-41,25-Jul-46,J.W.Green,6,(CASC); York Co.: Wash. Twp.,26-Jun-23,P.J.Spangler,1,(USNM); unkown counties: "Penn.",?,G.M.Green coll'n,1,(USNM); E Park,,H.W. Wenzel coll'n,1,(OSUC); Frankford,7-4,?,1,(USNM); Rhode Island: Kent Co.: Warwick,?,21-Apr-1899,E. E. Calder,2,(UMAA); Virginia: Fairfax Co.: ?,23-Jun-20,A.Nicolay,1,(USNM); Gt. Falls,11-Jun-10,E.Shoemaker,1,(USNM); "Va.",19-Sept-1880,?,1,(USNM); ?,?,ex Henry Ulke colln.,2,(CMNH); Wisconsin: Milwaukee Co.: ?,6-Jul-86,W.M.Wheeler,1,(USNM); Dane Co.: Madison,?-Jun-38,H. R. Dodge,1,(WSUC); West Virginia: Berkeley Co.?: Berkeley,?,Hubbard&Schwarz col.,2,(USNM); Mercer Co.: Camp Cr. St. For.,2-Oct-70,S. Bird,1,(CNCI); unknown state, county, or locality: 2, (INHS);

Panscopus (Panscopus) impressus Pierce
(Map 3, Figs. 5, 31, 55)

Panscopus (Nomidus) impressus Pierce 1913:395. Leng 1920:312.

Panscopus impressus . Blatchley, 1916:106. O'Brien and Wibmer 1982:63.

Panscopus (Panscopus) impressus . Buchanan 1927:27. Schenkling and Marshall 1931:40. Buchanan 1936:4. Blackwelder 1939:66.

Panscopus (Panscopus) impressus thoracicus Buchanan 1936: 4. Blackwelder 1939:66.

Panscopus (Panscopus) alternatus . Pierce 1913:394 (misidentification, not Schaeffer 1908)

Type material .— Holotype ♀ "Stone Cr./ Lee Co. Va.; Coll. Hubbard /& Schwarz; TYPE/ No. 14642/ USNM (red label); *Panscopus / impressus* / Pierce". Paratypes: "Stone Cr./ Lee Co. Va.; Coll. Hubbard /& Schwarz; Paratype / No. 14642/ USNM (red label)" 2, (USNM).
In addition, I have examined the following type material of *Panscopus impressus thoracicus* Buchanan:

Holotype ♂ "Round Knob/ 24-6 N.C.; Coll Hubbard/ & Schwarz"; TYPE USNM 50831 *Panscopus thoracicus* Buchanan (red label); "*Panscopus/ impressus/* Pierce/ subsp./*thoracicus* / ♂ type Buch.".
Paratypes: "Round Knob/ 26-6 N.C.; Coll Hubbard/ &Schwarz; USNM/ Paratype No./ 50831 "(red label); 3, (USNM), 1, (CASC).
"Black Mount/ N.C. IX.13; BROOKLYN/ MUSEUM/ COLL. 1929; alternatus/ (in Brook./ Mus coll.); USNM / Paratype No./ 50831; 3,(USNM).
Black Mtns, N.C., VII-6-1912, VII-10-1912, VII-16-1912, VII-21-1912, Beutenmuller, Casey bequest 1925, PARATYPE USNM 50831 4, plus 2 others

not bearing paratype label,(USNM).
Black Mtn.,Late May 1910,F.Sherman, 1,(USNM).

Diagnosis .— Adults of *P. impressus* exhibit the subgeneric characters of *Panscopus s. s.* in having a pair of setae inserted about the middle of the ventral surface of the prementum, and elytral humeral angles sinuous. In addition, the costate and stoutly setose alternate elytral intervals, flat non-setose even intervals and pronotum with sides markedly curved, widest at, or slightly anterior to middle, distinguish adult specimens as belonging to this species.

Description .— Size: ♀♀ : Length 7.1-9.1 mm (n=10); width across elytra 3.1-4.0 mm (n=10). ♂♂ : Length 6.5-7.8 mm (n=8); width across elytra 2.6-3.0 mm (n=8) (other measurements, Table 5). Head: frons separated from rostrum in lateral view, by broad, transverse depression on frons between eyes; rostrum unicarinate, median longitudinal carina low and covered with vestiture; angular nasal plate glabrous, distinctly delineated; vestiture of frons and rostrum of dense overlapping appressed scales, incomplete row of sparsely distributed decumbent slightly flattened setae on rostrum, loose group of seven to eight setae supra-orbitally. Antennae: scape extended to or beyond middle of eye when next to head and rostrum; scape covered in dense flat scales, and sparsely distributed decumbent setae, nearly obscuring integument over most of its length, funicular annuli elongate (esp. 1 and 2) shiny integument visible, with scattered decumbent thin setae, annuli 6 and 7 with additional, fine setae, more densely distributed over surface. Pronotum: approximately one quarter wider than long; lateral margins convex, more markedly so in males; median longitudinal sulcus a rounded trough more pronounced at anterior third; surface irregularly rugose-tuberculate, with dense vestiture of flat, appressed, striate scales and scattered, decumbent setae. Elytra: broadly oval in dorsal view, approximately three-quarters of length, in females; proportionately narrower in males; declivity rounded ,in lateral view, near apex, posterior margin reflexed ventrally; alternate (odd-numbered) intervals elevated, slightly carinate, with partly double rows of coarse, decumbent to semi-erect setae directed posteriorly; even intervals flat, or nearly so, and with few or without setae; serial punctures obvious, each with slightly oblong scale; surface vestiture of dense, overlapping, appressed, striate scales various in colour from brown to beige to cupreous, in patches, mottled, greyish brown in colour with irregular darker and lighter patches. Legs: tibiae 1 and 2 with row of two to five stiff spines, about same length as surrounding setae on ventro-medial margin, in apical half; tibia 3 with small mucro at apex; corbellar area near apex of tibia narrowly and indistinctly closed. Abdomen : five sterna visible in males and females, sterna 1 and 2 slightly convex at middle in females; sternum 1 markedly concave at middle, sternum 2 less so, in males. Genitalia : ♀♀ : (Figs. 5, 31) tergum 8 broadly convex dorsally, rounded apically, sternum 8 (spiculum ventrale) with apical expansion broad and slightly convex ventrally, rounded at apices, cleft medially in apical third, with fine setae apically, directed postero-ventrally, coxites 1 and 2 angular in dorsal view, narrowed apically, styli with three or four fine setae apically, bursa copulatrix membranous, no sclerotized structures internally; spermatheca slightly scythe-shaped, thin and tapering, acute apically.; ♂♂ : (Fig. 55) aedeagus slightly recurved, concave ventrally, apex broadly rounded apically in dorsal view; manubrium of tegmen nearly as long

as median lobe; median struts approximately one-third longer than median lobe; surface texture of internal sac granular, with small field of small sclerotized denticles, apex (anterior end in inverted sac) of internal sac contains oblong, transverse small sclerite and two thin tapering small sclerites oriented longitudinally, one each side.

Life History Data .— Most adults have been collected in the months of May, June, and July, with a few bearing dates in August, and September. Single specimens have been taken in pitfall traps in early April and Sept-Oct. One specimen was extracted from litter with Berlese funnels in March.

Host plant associations .— I have collected adult specimens from shrubs or young saplings of *Carpinus caroliniana , Fagus grandifolia, Cornus* sp. (possibly *drummondi* Meyer, roughleaf dogwood), *Crataegus pruinosa, Betula alleghaniensis, Ostrya virginiana,* and *Vaccinium* sp. in forests of predominantly deciduous trees, with a few mixed conifers in the southern Appalachian region. Adults of this species are not host specific, and seem to be able to feed on the leaves of a large number of broad-leaved shrubs and young trees. A few borrowed specimens bear labels indicating they were taken from *Smilax,* and "silverbell". Other clues to the habitat affinities of this species, taken from specimen labels, include three specimens sifted from oak-ash litter, and one specimen taken on the forest floor under fir.

Geographical distribution .— This species occurs in the southern Appalachian region at altitudes between 610 and 1680 metres (Map 3).

Phylogenetic relationships .— *P. impressus* is the postulated adelphotaxon of *P. erinaceus* (Fig. 79).

Chorological affinities .— The ranges of *P. impressus* and *P. erinaceus* are adjacent but non-overlapping (Map 3).

Material examined .— In addition to the holotype, approximately 220 specimens were examined.
UNITED STATES OF AMERICA:
Alabama: Clay Co.: Pyziton,?,H.H.Smith,1,(USNM); Randolph Co.: Wadley,?,H.H.Smith,1,(USNM); Georgia: Clarke Co.: Whitehall Forest,21-Apr-76, R. Turnbow, 2, (CWOB); Whitehall Forest,24-Jul-77, R. Turnbow,pitfall, 1, (RHTC); Whitehall Forest,1-5-May-77, 19-26-Jul-77,26-Sep-3-Oct-77, R.Turnbow,pitfall, 3,(CWOB); Whitehall Forest,5-15-Sep-78, 2-11-Apr-79,C. L. Smith,pitfall, 2,(CWOB); Dade Co.,Cloudland Canyon State Park,8-May-52,O. Peck,1,(CNCI); Towns Co.: High School Falls Trail,3-Jul-84,R. Turnbow, 2,(CWOB); Hwy 75 at Appalachian Trail,2-Jul-84,R.Turnbow,1,(CWOB), 2,(RHTC); White Co.: Andrew's Cove Cpgd. 10 km N Robertstown,18-21.May.1988,T. G. Spanton, ex: *Cornus* sp., *Carpinus caroliniana, Fagus grandifolia*, 21,(TGSC); unknown county: Thomson's Mills,?,?,1,(USNM); Kentucky: "KY", ex Henry Ulke coll'n.,2,(CMNH); North Carolina: Bunscombe Co.,16 km N Asheville,29-Jul-79,D.R.W.,1,(USNM); Haywood Co.,Sunburst,30-Jun-35,O. L. Cartwright,2,(CASC); Henderson Co.: Hickory Nut Gorge,Bat Cave,30-Aug-74,D.R.Whitehead,3,(USNM); Jackson Co.: Cullowhee Cane Ck. 700 m,25-May-84,S. Marshall,1,(RSAN); Balsam 16-Jun-8-Jul-1910, Blatchley coll'n., 2, (PURC); Balsam, 7-Jul-17, H. W. Wenzel, 3, (OSUC); Balsam, 26-Jun-56, 22-Sep-56, 7-Jul-58, 15-Jul-58, 29-Jun-59, 12-Jun-61, W. Rosenburg,6,(NMDC); 25-Jun-49,22-Jul-56, 28-Jul-56, 6-Aug-56, 17-Aug-57, 7-

Jul-58, 15-Jul-58, 6-Aug-58, W. Rosenberg, 9, (USNM); Balsam, 14-Jun-57, 19-Jul-60,2-Sep-60,W. Rosenberg,3,(CWOB); Balsam Jones Knob Alt. 1370 m,15-Jun-60,W. Rosenberg,1,(CWOB); Balsam Jones Knob, Alt. 1680 m,23-Sep-60,W. Rosenberg,1,(CWOB); Macon Co.: Highlands,1-Jun-57,H.F. Howden,3,(HAHC); Highlands 1158 m,2-Jun-57, W. J. Brown,1,(CWOB); Highlands 1158 m,26-May-57, J. R. Vockeroth,1,(CNCI), 2-Jun-57, 7-Jun-57, 11-Jun-57, 13-Jun-57, 20-jun-57, W. J. Brown, 8,(CNCI); Highlands, 5 km S,29-May-73,W. R. Suter,litter under Rhododendron, 1, (CWOB); 6.4 km N Franklin,18-Mar-76,L.E.Watrous,berlese, thin litter nr R.,1,(CWOB); Coweeta Hydr. Sta, Shope Fork Rd. 1100 m,30-May-83,D. S. Chandler,sifting oak-ash litter, 4,(CWOB); Coweeta Hydrologic Lab,13-Jul-74, 20-Jun-79, R. Turnbow, 2, (CWOB), 13-Jul-74, 3-Jul-83,R. Turnbow,2,(RHTC); Standing Indian Cpgd. 5 km E. Rainbow Springs,25-May-88,E. Fuller,sweep, at night,2,(TGSC); Standing Indian Cpgd., 8 km SE Rainbow Springs",28-May-88,T. G. Spanton,*Salix*, at night",1,(TGSC); Standing Indian Cpgd., 8 km SE Rainbow Springs,25-30.May.1988,T. G. Spanton,*Crataegus pruinosa* , night,5,(TGSC); Standing Indian Cpgd., 5 mi SE Rainbow Springs,25-30-May-88,T. G. Spanton,*Vaccinium* sp.,8,(TGSC); Standing Indian Cpgd., 8 km SE Rainbow Springs,26-29.May.1988,T. G. Spanton,*Ostrya virginiana* ,11,(TGSC); Standing Indian Cpgd., 8 km SE Rainbow Springs,26-29.May.1988,T. G. Spanton,ex:*Comus* sp., 1,(TGSC); Randolph Co.: Ashboro,3-Apr-29,C.R.Crosby,1,(CUIC); Transylvania Co.: 26 km N Rosman ~1650 m,31-Jun-79,D.R.W.,1,(USNM); 8 km N Balsam grove,2-Aug-79,D.R.W,1,(USNM); Yancey Co.: Mt. Mitchell,31-May-73,Forest floor fir, 12-Jun-73, litter at log, W. R. Suter, 2, (CWOB); Valley of Black Mtns.,20-30-Jun-06,16-Sep-06,W.Beutenmuller, 2,(AMNH); Black Mtn.Cpgd., 8 km due E., Mt. Mitchell,31.May-1.Jun-1988,T. G. Spanton,*Betula alleghaniensis* , night, 14,(TGSC); Black Mtn.Cpgd., 8 km due E., Mt. Mitchell,3-Jun-88,T. G. Spanton,*Betula alleghaniensis* , night,1,(TGSC); Black Mtn.Cpgd., 5 mi due E., Mt. Mitchell,31.May-1.Jun-1988,T. G. Spanton, 4,(TGSC); Black Mtns, 8-Jun,10-Jun, 22-Jun, 20-Jul, ?,10,(AMNH); Black Mtns.,June 1902,Van Dyke Coll.,2,(CASC); Black Mtns.,27-May-29-Jul-12,Beutenmuller,20,(CASC); Highlands,1-May-57,H. F. Howden,1,(CNCI); Round Knob,,Hubbard&Schwarz,1,(USNM); unknown counties: Gt. Smoky Mtns. Natl. Park, Bone Valley Creek,21-24-Jul-64,J. F. Cornell,sweeping,1,(CWOB); Pennsylvania: unknown county: Indian Creek,16-Jun-41,?, 2,(INHS); South Carolina: Oconee Co.: Long Creek,24-Oct-33,J.G.Watts,1,(USNM); Pickens Co.: 5 km S Rocky Bottom,29-Apr-73,R.Turnbow,berlese of duff,1,(CWOB); Tennessee: Anderson Co.: AEC Controlled Area, Oak Ridge,14-Apr-56,Auerbach,leaf mold,M, 1,(HAHC); Blount Co.: Great Smoky Mtns. Natl. Park, Cove Forest 3000' ,20-Jul-47,R. H. Whittaker,2,(INHS); Gt.Smoky Mt.N.Pk.,Green Briar Cove,610 m.,28-Oct-54,H&A Howden, 1,(HAHC); Knox Co.: Knoxville,20-May-57,W.R.M. Mason, 1,(CNCI); Sevier Co.: Elkmont, Gt. Smoky Mtns. Natl. Pk.,11-Jun-67,F.J. Moore,1,(OSUC); Gatlinburg, Grt. Smoky Mts. Natl. Park,14-Jun-42,H. S. Dybas,2,(FMNH); Gt. Smoky Mtns. N. Pk. Gatlinburg,21-Jul-47,R.H.Whittaker,2,(USNM); Gt. Smoky Mtns. N. Pk. nr. Gatlinburg,15-19-Jun-66,A.E.Lewis,1,(CWOB); Great Smoky Mtns. National Prk,19-Jun-30,C. H. Seevers, 1,(FMNH); Great Smoky Mtns. Natl. Pk.,21-Jun-42,D.J. & J.N. Knull, 2,(OSUC); Gt.Smoky Mt. N.Pk., 610 m,21-May-55,H&A Howden,*Smilax* ,

1,(HAHC); Gt.Smoky Mt. N.Pk., 610 m,23-Jul-55,H&A Howden,Silverbell, 5,(HAHC);

Subgenus *Pseudopanscopus* Buchanan

Pseudopanscopus Buchanan 1927:33. Gender, masculine. Type species *Panscopus costatus* Buchanan, by monotypy. Buchanan 1936:3, 12. Blackwelder 1939:66. Kissinger 1964:36.

Derivation of name .— *Pseudo* means something which resembles something else, but isn't. Thus *Pseudopanscopus* is something which resembles, but isn't, *Panscopus sensu stricto.*

Diagnosis .— Adult representatives of this subgenus are recognized by a very broad, deep median longitudinal sulcus on the pronotum, metepisternal suture a fine line, and elytral setae very broad, flat and scale-like.

Included species .— *P. costatus* and *P. capizzii* .

Phylogenetic relationships .— *Pseudopanscopus* is the postulated adelphotaxon of the ancestor of *Dolichonotus* + *Phymatinus* + *Nocheles* .

Panscopus (Pseudopanscopus) costatus Buchanan
(Map 4, Figs. 6, 32)

Panscopus (Pseudopanscopus) costatus Buchanan 1927-33. Schenkling and Marshall 1931:41. Buchanan 1936:12. Blackwelder 1939:66.

Pseudopanscopus costatus . Hatch 1971:288.

Panscopus costatus . O'Brien and Wibmer 1982:63.

Type material .— Holotype ♀ (USNM No. 28917) Chilliwack, B. C. ex.: stomach *Bufo boreas* U. S. Biol. Survey 461. "Pseudopanscopus costatus Buchanan, L.L.B. '26". The left metatarsus of this specimen is glued, in two parts, on a point..

Derivation of specific epithet .— *Costatus* means ribbed (< L. *costa* , rib, side). This name probably was intended to refer to the ribbed or costate appearance of the elytra, having the alternate intervals raised to form low ridges, as in many other species of this and other genera of the Leptopiini.

Diagnosis .— The subgeneric characters mentioned above, plus alternate elytral intervals costate, extended uninterrupted the length of the elytra, are sufficient to identify adult specimens as representatives of this species.

Description .— Size: ♀♀ : (Figs. 6, 32) (males unknown) Length 7.3-7.8 mm (mean=7.6, n=5), width across elytra 3.3-3.6 mm (mean=3.5, n=7).(other measurements, Table 6) Head: frons separated from rostrum in lateral view, by broad, transverse depression on frons between eyes; rostrum without carinae, or if present, carinae not evident through vestiture; angular nasal plate with distinct v-shaped carina; rostrum and frons with dense layer of appressed scales, rostrum with scattered, semi-erect, broad, flattened, setae; frons with dense group of 10 to 12 broad, flattened, semi-erect to erect setae supra-orbitally. Antennae: scape extending to middle of eye when next to head and rostrum; scape covered by dense layer of overlapping, striate, appressed

scales, concealing integument, and scattered, semi-erect, broad, flattened, striate, scale-like setae; all seven funicular annuli with dense vestiture of appressed short, fine (secondary) setae in addition to scattered decumbent longer, thin (primary) setae; annuli 1 and 2 of funicle not as elongate as in *erinaceus, impressus* and others; annulus 7 slightly wider than long. Pronotum: one-tenth to one-sixth wider than long; median longitudinal sulcus broad and distinct length of pronotum; dorsal surface irregularly rugose-tuberculate; vestiture of dense striate scales and scattered decumbent, flat, broad, striate scale-like setae. Metathorax : metepisternal suture visible its entire length as fine line. Elytra: combined width approximately four-fifths of length, widest at anterior third, thence narrowed apically; declivity curved, posterior margin straight and reflexed forward, near apex, ventrally, in lateral view; anterior margin produced forward, in form of overhanging cliff at junction of elytra and thoracic nota; alternate (odd numbered) intervals elevated, with double or partly triple row of decumbent to semi-erect broad, flat, scale-like setae; even intervals flat or only slightly convex, setae few or absent; vestiture of dense overlapping striate, appressed scales light brown to beige in colour. Legs: tibiae 1, 2, and 3 each with row of four to five stiff spines, about length of surrounding setae, on ventro-medial margin in apical half, less obvious on tibia 3; femora and tibiae with dense vestiture of appressed, overlapping scales and scattered decumbent, broad, flattened setae, concealing integument; corbellar area of tibia 3 indistinctly closed, with short coarse setae. Abdomen: five visible sterna (3 to 7) in females; dense vestiture as on legs, elytra, etc. Genitalia: (Figs. 6, 32) sternum 8 (spiculum ventrale) with apical expansion broad and spade-shaped , convex ventrally, cleft medially, with fine setae apically; coxites 1 and 2 narrowly angular- tapered apically, styli with two or three primary setae apically; bursa copulatrix membranous, no sclerotized structures visible; spermatheca crudely sickle-shaped, very stout basally, tapered markedly to thin apex.

Life History Data .— Adult female specimens have been collected in the months of April, May, and June. Males are unknown.

Host plant associations .— Two specimens I saw bear labels indicating they were found on strawberry plants.

Geographical distribution .— Weevils of this species are known from a few localities in northeastern Washington, and southern Vancouver Island, British Columbia (Map 4)

Phylogenetic relationships .— *P. costatus* is the postulated adelphotaxon of *P. capizzii* (Fig. 79 .

Chorological affinities .— The range of this species and *P. capizzii* are adjacent to one another and not overlapping (Map 4).

Material examined .— In addition to the holotype, seven specimens were examined.
CANADA:British Columbia: Victoria, 21-Jun-28, W. Downes, 1, (CNCI).
UNITED STATES OF AMERICA: Washington: Puyallup, 2-May-32, J Wilcox, 1, (OSUO); Puyallup, 22-Apr-33, W. W. Baker, R Hopping coll'n, 1, (CASC); Puyallup, 6-Aug-34, W. W. Baker, Schwab coll'n, 1, (UCDC); "Was.",(no date or collector), 1, (USNM).

Panscopus (Pseudopanscopus) capizzii (Hatch)
(Map 4, Figs. 7, 33, 56)

Pseudopanscopus capizzii Hatch 1971-288 [in key].

Panscopus capizzii . O'Brien and Wibmer 1982:62.

Type material .— Holotype ♀: (C.A.S. Type No.12453) "Curry Co., ORE./ Douglas fir duff / Gold Beach / June 21, 1955 /Joe Capizzi ; TYPE/ Pseudopanscopus/ capizzii/ 1968- M. Hatch (bright fluorescent orange label); OSUO; California Academy/ of Sciences/Type No. 12453".
Paratype (not seen): same locality, date and collector as holotype 1, (OSUO?).

Notes about synonymy .— Hatch (1971)described this species under the generic name *Pseudopanscopus* with *P. costatus*. O'Brien and Wibmer (1982) synonymized this generic name, placing *P. capizzii* Hatch, and *P. costatus* Buchanan, in the genus *Panscopus.*

Derivation of specific epithet .— This is the latinized adjectival form of the surname of the collector of the type material, Mr. Joseph Capizzi.

Diagnosis .—Adults of this species are distinguished easily from those of all other *Panscopus* species by the very deep, prominent longitudinal trough in the pronotum, and in having the costae of elytral intervals 3 and 5 interrupted near the elytral declivity, forming large rounded tubercles, each with a few to several blunt, flattened, coarse, striated scale-like setae. *P. capizzii* is unique, among *Panscopus* species, in that males and females have uniformly flat abdominal sterna 3 and 4 (the first two visible sterna), in contrast to other *Panscopus* species, where the females exhibit a slightly convex curvature to the surface of the first two visible sterna, and males exhibit a slight, but easily observable concavity of the first two externally visible abdominal sterna.

Description .— Size: ♀♀ : Length 6.1 mm (n=1); width across elytra 2.9 mm (n=1). ♂♂ : Length 5.8 mm (estimated from headless specimen, n=1), width across elytra 2.5 mm (n=1).(additional measurements, Table 7). Head: transverse impression at base of frons shallow; rostrum non-carinate; angular nasal plate not clearly delineated, with sharp v-shaped carina; vestiture on frons and rostrum of dense overlapping scales, few setae present, seven or eight semi-erect, broad, flat setae in a close group supra-orbitally. Antennae: scape extended to anterior third of eye, when next to head; scape with dense vestiture of scales and setae throughout, concealing integument; funicular annuli with few thin long primary setae, and vestiture of thin fine short setae, sparsely distributed on proximal annuli, increasingly more dense on distal annuli; annulus 7 very slightly wider than long. Pronotum: approximately one-eighth wider than long; lateral margins less convex than for most *Panscopus* species; surface coarsely rugose-tuberculate; integument completely hidden by dense vestiture of overlapping striate scales, coarse, broad, striate, semi-erect setae scattered over surface, emanating from topographic high points; median longitudinal sulcus deep and broad, the length of pronotum. Metathorax : proepisternal suture fine line the length of proepisternum. Elytra : broadest at anterior sixth, narrowed posteriorly; combined width approximately four-fifths of length, declivity broadly rounded in lateral view; alternate intervals elevated, even intervals nearly flat and non-setose; carinate alternate intervals interrupted, modified elevated tubercles at declivity in intervals 3 and 5, and

near humeral angle in interval 7; setae on tubercles and other portions of alternate intervals, decumbent to semi-erect, broad, flattened and striate. Legs : spines of ventro-lateral margin of tibiae 1, 2, and 3 not developed more than surrounding setae; corbel of tibia 3 indistinctly closed, with short stout acute setae inserted near corbellar area. Abdomen : five sterna visible on female; sterna 1 and 2 flat in both sexes, not obviously convex in females or concave in males; vestiture of dense layer of overlapping scales and scattered, broad, flattened, decumbent to semi-erect setae. Genitalia : ♀♀ : (Figs. 7, 33) sternum 8 (spiculum ventrale) with apical expansion approximately 1/4 of total length, broad and somewhat spade-shaped, slightly convex ventrally, round at apices, with fine setae apically, directed postero-ventrally; coxites 1 and 2 broadly angular in dorsal or ventral view narrowed apically, rounded apically in lateral view, styli with three primary setae apically; bursa copulatrix membranous, without sclerotized structures; spermatheca sickle-shaped, tubular, medium in width, tapered toward apex. ♂ ♂ : (Fig. 56) aedeagus thin dorso-ventrally, less recurved than most *Panscopus* species, apex of median lobe acute, tapered to thin point in lateral view, in dorsal view with narrow acute projection ; manubrium of tegmen slightly shorter than median lobe of aedeagus; median struts as long as median lobe; internal sac with surface texture finely granular, with pair of sclerites apically (anteriorly, in inverted sac), sclerites flagellum-like, crescent shaped in dorsal or ventral view , sigmoid, tapered to acute apex in lateral view.

Life History Data .— Adults have been collected in the months of June and July.

Geographical distribution .— This species occurs only in northwestern California and southwestern Oregon (Map 4).

Phylogenetic relationships .— *P. capizzii* is the postulated adelphotaxon of *P. costatus* (Fig. 79).

Chorological affinities .— See this topic for *P. capizzii* above (Map 4).

Material examined .— In addition to the type material I have seen only two other specimens of this species:♀ "Bullrun Flat/ Garberville, Cal./ VII-27-34; Humboldt Co.; Van Dyke / Collection" (CASC), and ♂ "Van Duzen Riv./ Humboldt Co./ Cal. VI-5-36; near Carlotta; Van Dyke/Collection" (CASC).

Subgenus *Dolichonotus* Buchanan

Dolichonotus Buchanan 1936-9. Gender male. Type species *Panscopus (Dolichonotus) convergens* Buchanan, by original designation. Blackwelder 1939:66. Kissinger 1964:36.

Derivation of name .– *Dolichos* < Greek, long, and *notos* < Greek, back referring to the relatively longer pronotum in adult representatives of *Dolichonotus* . Specimens of this subgenus have the pronotum approximately as long as wide,and only slightly convex laterally in dorsal view, in contrast to most other *Panscopus* species in whicih the pronotum is wider than long, with lateral margins more rounded convexly.

Diagnosis .– Specimens representing this subgenus exhibit a scape extended to , or nearly to, the posterior margin of eye, a pronotum approximately as long as wide, and five visible abdominal sterna in both sexes.

Included species .– *P. convergens, P. oregonensis,* and *P. acutisetus* .

Phylogenetic relationships .– *Dolichonotus* is the adelphotaxon of *Phymatinus* +*Nomidus* .

Panscopus (Dolichonotus) convergens Buchanan
(Map 5, Figs. 8, 34, 57)

Panscopus (Dolichonotus) convergens Buchanan 1936:10. Blackwelder 1939:66

Panscopus convergens . Hatch 1971:289. O'Brien and Wibmer 1982:63.

Type material .— Holotype ♂: "Corvallis/ORE; 20-V. 1925/ E.R. Buckell; 17 Bu; TYPE/ USNM/ 50647; Panscopus / (Dolichonotus) / convergens/ ♂ TYPE Buchanan" (USNM). Paratype ♀: "Corvallis/ OR ; 20-VI. 1925 / E. R. Buckell; 16 Bu; Panscopus / (Dolichonotus)/ convergens/ ♀ paratype Buch." (USNM).

Derivation of specific epithet .— The word *convergens* is from the Latin *cum* , together, with the Latin *vergo* , bend, incline, or tend toward. This probably refers to the convergent angle of the lateral margins of the elytra through the mid portion of their length, which, in other species of this genus are more nearly parallel.

Diagnosis .— Specimens with the above subgeneric characters, as well as a fifth externally visible abdominal sternum one-half to two-thirds as long as broad, alternate elytral intervals raised and costate, even intervals completely or nearly non-setose, and the setae of alternate intervals blunt-ended and slightly broadened and flattened, belong to this species.

Description .— Size: ♀♀ : Length 6.4-7.5 mm (mean=6.9, n=12), width across elytra 2.5-3.2 mm (mean=2.85, n=12); ♂ ♂ : Length 5.6-6.9 mm (mean=6.2, n=12), width across elytra 2.1-2.5 mm (mean=2.3, n=12); (other measurements, Table 8). Head: transverse impression at base of frons almost continuous with rostrum in lateral view; frons with short, narrow shallow longitudinal sulcus, in some individuals short narrow glabrous interruption of vestiture, between eyes; rostrum apparently non-carinate in most individuals, in fact rostrum with three thin small longitudinal carinae, evenly concealed by vestiture in most individuals, some specimens with thin median longitudinal carina partly visible among scales of vestiture; angular nasal plate indistinct, not clearly delineated from rest of rostrum, v-shaped carina indistinct; vestiture of frons and rostrum of dense overlapping, appressed, striate scales, and scattered, decumbent, broad, blunt setae, group of 10 to 12 such setae inserted supra-orbitally. Antennae: scape extending to middle of eye; scape vestiture of appressed, elongate scales and scattered, decumbent setae, integument nearly obscured its entire length; funicular annuli with few small sparsely distributed, long, thin, decumbent setae, directed apically, and scattered, thin, fine, appressed secondary setae, also directed apically; ;shiny integument visible

length of funicle; secondary setae more numerous on funicular annulus 7; annulus 7 nearly as broad as long. Pronotum: approximately as wide as long; lateral margins less convex than in most *Panscopus* species, surface coarsely rugose-tuberculate; integument obscured by vestiture of overlapping, appressed, striate scales, and scattered, decumbent, flattened, blunt setae; median longitudinal sulcus shallow, extended length of pronotum. Elytra: widest at anterior sixth, thence narrowed slightly to apical quarter; lateral margins nearly straight for 2/3 of length, in dorsal view, I with shallow concavity between intervals 7 and 9, opposite coxa 3, in lateral view; apical declivity rounded, posterior margin of elytra nearly vertical in lateral view, in males, slightly reflexed in females; alternate intervals elevated, with partly double rows of decumbent, flattened setae, serial pits each filled with round to oval striate scales, 1/2 larger in length and width, than surrounding scales, integument obscured throughout with dense vestiture of overlapping, appressed, striate scales. Legs: tibiae without obvious spines on ventro-lateral margin, corbel of tibia 3 indistinctly closed, with short, coarse, acute setae inserted near corbellar area; vestiture of femora and tibia as on prothorax and elytra. Abdomen : five visible sterna visible in females and males, vestiture of dense scales and setae, integument nearly obscured, sternum 1, and to a lesser extent, sternum 2, concave at middle in males, slightly convex in females. Genitalia : ♀♀ : (Figs. 8, 34) sternum 8 triangular in apical expansion, with fine setae apically; coxites 1 and 2 angular in dorsal view, rounded apically in lateral view ; bursa copulatrix with pair of slightly crescent-shaped setae near anterior end; spermatheca more narrowly elbowed not as broadly sickle-shaped as in most Panscopus species. ♂♂ : (Fig. 57) aedeagus thin, slightly curved in lateral view, convex dorsally , concave ventrally (un-extended condition); apex of median lobe angular in dorsal view with acute apical projection viewed postero-dorsally ; manubrium of tegmen approximately as long as median lobe; median struts as long as median lobe; internal sac with finely granular texture in posterior half (inverted sac) without sclerites internally.

Life History Data .— Most specimens I have seen were collected in the months of May, June, and July. A few specimens have been collected in August, September, and November. At other times of year, specimens have been collected from litter, in the months of March , and December.

Host plant associations .— I saw no records of specimens of *P. convergens* taken directly from any species of plant. Some clue to their habitat affinity can be gleaned from records of specimens taken from duff, including litter of Noble fir (*Abies procera*), Douglas fir (*Pseudotsuga menziesii*), fern and maple litter, alder and spruce litter, and bigleaf maple (*Acer macrophyllum*) duff.

Geographical distribution .— This species is known to occur in western Oregon at altitudes between approximately 180 and 1,220 metres (Map 5).

Phylogenetic relationships .— *P. convergens* is the postulated adelphotaxon of (*P. oregonensis* + *P. acutisetus*) (Fig. 79).

Chorological affinities .— The ranges of *P. convergens* and *P. oregonensis* overlap in western Oregon and are separated from the range of *P. acutisetus* (Map 5).

Material examined .— In addition to the type material listed above, approximately 100 specimens have been examined, as follows:
UNITED STATES OF AMERICA:
Oregon: Benton Co.: Mary's Peak 1100 m,17-May-83,D. S. Chandler,sifted spruce litter,1,(CWOB); Mary's Peak, 1220 m, 8-May-58,B.D.Ainscough,Noble Fir duff,2,(OSUO); Philomath, 12.8 km W. 300 m,12-May-83, D. S. Chandler,sifted fern&maple litter,1,(CWOB); Coos Co.: Charleston,17-Jun-51,K.M.Fender,1,(OSUO); Marshfield,14-Jun-14,Van Dyke collection,6,(CASC); Marshfield,10-Jun-14,Van Dyke collection,1,(CASC); Marshfield,11-Jun-36,Van Dyke collection,24,(CASC); Douglas Co.: Ash, 1.6 km S.&3.2 km W. Elliot State For. 340 m,11-Dec-71,E. M. Benedict,big leaf maple duff,2,(HAHC); Josephine Co.: Silver Cr. Falls,1-Aug-48,K.M.Fender,1,(OSUO); Silver Creek,2-Aug-44,2,(OSUO); Silver Creek Falls,29-May-38,K.Gray&J.Schuh, 1,(CWOB), 2,(USNM); Lane Co.: Camp Lane,5-Aug-58,J. Capizzi,duff,1,(OSUO); Glenada, Jun-Jul.51, B. Malkin, 8,(FMNH), 8, (OSUO); Glenada,1-15.Jun.52,B. Malkin, 3,(FMNH), 2,(OSUO); Glenada,19.May-8.Jun-57,B. Malkin,2,(FMNH); Lincoln Co.: Nashville, 1.6 km N. 180 m, 20-Dec-71,E. M. Benedict,3,(HAHC); Waldport, 11-Jun-62, David R. Smith,1,(DEUN); Waldport, 3.2 km E., 15-May-83,D. S. Chandler, sifted alder&spruce litter, 3,(CWOB); Lincoln Co., ?,10-Jun-41,F. W. Nunenmacher, 4,(FMNH); Multnomah Co.,Portland,22-May, Hubbard & Schwarz, 1,(USNM); Polk Co.: Black Rock, 16km SW of Dallas,27-Jul-60, Don Allen,1,(DEUN); Tillamook Co.: Blain, 11km SE, For.Serv. Rd. 533 430 m,15-Mar-72,E. M. Benedict,Douglas fir duff,8,(HAHC); Hemlock,5-Apr-49, ?, 1,(OSUO); Kiwanda viewpoint, cape lookout,?,E. M. Benedict,1,(HAHC); Oceanside,6-Sep-65,Kenneth Goeden,1,(ODAC); Sand Lake, 4 km N, 2.4 km W. 180 m, 4-Nov-72,Benedict,3,(HAHC); Unknown county: Boyer,22-May-37,?,soil sample #11,1,(OSUO); Boyer,28-May-39,17-Jun-56,K.M. & D.M. Fender,2,(OSUO); Devil's Lake,25-Apr-19??,K.M. & D.M. Fender,1,(OSUO).

Panscopus (Dolichonotus) oregonensis Buchanan
(Map 4, Fig. 58)

Panscopus (Dolichonotus) oregonensis Buchanan 1936-11. Blackwelder 1939:66.

Panscopus oregonensis . Hatch 1971:289. O'Brien and Wibmer 1982:63.

Type material .— Holotype ♂ (USNM No. 50648) Forest Grove, Oregon June 18, 1923.

Derivation of specific epithet .— The specific epithet undoubtedly refers to the known specimens having been collected in Oregon.

Diagnosis .— The subgeneric characters mentioned above, in combination with the fifth visible sternum being nearly as long as broad, and tibia 3 broadly emarginate on the ventral margin, are sufficient to identify specimens of this species.

Description .— Size : ♂ ♂ : Length 8.7 mm (n=1), width across elytra 3 mm; (other measurements, Table 9). Head : transverse depression at base of frons very faint, frons and rostrum almost continuous in lateral view, rostrum with thin, sharp longitudinal medial carina, lateral carinae indistinct; apical nasal plate not clearly delimited from dorsal surface of rostrum, v-shaped carina

indistinct. Antennae: scape extended beyond hind margin of eye. Pronotum : approximately as wide as long, lateral margin roundly convex; median longitudinal sulcus distinct, narrow, extended length of pronotum, surface rugose-tuberculate. Elytra : combined width only slightly more than half of length, alternate intervals elevated, with double or partly triple rows of decumbent, coarse setae; even intervals non-setose, serial punctures each covered with a scale approximately 1/2 longer and wider than surrounding scales; integument obscured by dense vestiture of overlapping, striate, appressed scales. Legs : spines on ventro-medial margin of tibia 1 and 2 weakly developed; tibia 3 broadly emarginate on medial margin in apical half; corbel of tibia 3 weakly closed with short acute setae encroaching on corbellar area. Abdomen : sternum 1 and 2 concave at middle in male; sternum 5 approximately 1/3 broader, at widest point, than long; integument largely concealed by dense vestiture of scales and setae. Genitalia : ♂ ♂ : (Fig. 58) aedeagus thin, long, slightly curved ventrally, apex of median lobe produced into long acute projection viewed laterally, or postero-dorsally; median lobe long, manubrium of tegmen approximately 3/4 length of median lobe; median struts approximately as long as median lobe not including apical projection; internal sac without sclerites.

Geographical distribution .— Weevils of this species are known to occur only in two localities in northwestern Oregon (Map 5).

Phylogenetic relationships .— This species is the postulated adelphotaxon of *P. acutisetus* (Fig. 79).

Chorological affinities .— The known ranges of this species and *P. acutisetus* are adjacent to one another, but are not overlapping (Map 5), however, with so few specimens known this may be artifactual.

Material examined .— In addition to the type specimen, I have seen only one other specimen collected at Black Rock, 16 km S Dallas, Polk Co., Oregon 3 Aug. 1960 by Don Allen (DEUN).

Panscopus (Dolichonotus) acutisetus **new species**
(Map 5, Figs. 9, 35)

Type material .— Holotype ♀ , label data reads: Goose Lake/ Modoc Co./ Cal V-24-49; R. M. Bohart/ Collector; UCDC.

Derivation of specific epithet .— The specific epithet refers to the thin and pointed elytral setae.

Diagnosis .— The long antennal scape extended to the hind margin of the eye is a character shared with *P. longiscapus, P. squamosus, P. michelbacheri, P. convergens* and *P. oregonensis*. The equally convex elytral intervals, and a row of setae on all intervals, serve to separate this species from *P. torpidus, P. convergens* and *P. oregonensis* , all of which have alternate intervals raised and the even intervals non-setose, or nearly so. The brown vestiture of scales and sparse decumbent thin setae serve to distinguish this species from specimens of *P. squamosus*, which have elytral setae squamose and appressed, and from *P michelbacheri*, specimens of which have a much

more sparse vestiture and much underlying integument visible giving them a nearly black colour.

Description .— Size: Length 8.05 mm, length of pronotum 1.95 mm, width of pronotum 2.07 mm, length of elytra 4.30 mm, width across elytra at widest point 3.16 mm, width across head at anterior margin of pronotum 1.36 mm, width of frons between eyes 0.78 mm, length of rostrum from apex to anterior margin of eye 1.33 mm, length of scape 1.36 mm. Colour: brown, with areas of lighter coloured scales laterally on prothorax and elytra; integument various from piceous on pronotum to rufescent on venter. Head: eye oval, frons continuous with rostrum in lateral view, frons wider than rostrum at base, rostrum narrowest at middle, widest near apex in dorsal view, median longitudinal carina on rostrum extended from between eyes to apex, apically in contact with V-shaped carina at posterior margin of nasal plate; scrobes deep and distinct near insertion of antennae,indistinct elsewhere. Antennae: attached dorso-laterally near apex of rostrum; scape long, extended to hind margin of eye when retracted next to head; vestiture of dense, appressed, striate scales and sparsely distributed thin but flattened, decumbent setae, directed distally. Pronotum: median longitudinal sulcus short narrow groove at middle, and small depression at anterior third; dorsal surface covered with rugae and punctures, lateral margins roundly convex; pronotum widest anterior to middle; postocular lobes distinctly developed, with very short vibrissae on anterior margin; vestiture of appressed, striate scales with integument visible among scales dorsally, scales more densely overlapped laterally on pronotum, scattered, decumbent, narrow, flattened setae on pronotum. Elytra: together oval in form, wider than prothorax, elytra firmly fused along midline (no longer so in the dissected holotype specimen) posterior declivity of elytra reflexed, sloped ventro-anteriorly in lateral view; intervals slightly convex, each serial puncture of striae with nearly round scale; surface of elytra covered with dense, overlapping, appressed, striate, nearly round scales, even intervals with single row of narrow, flattened, decumbent setae, alternate intervals with irregular, mostly double row of such setae. Legs: tibiae 1 and 2 each with three or four stout spines in distal half, on ventral margin, tibia 3 without such spines, long thin setae only on the ventral margin, corbellar area closed on tibia 3, corbellar area covered by appressed setae. Abdomen: sterna densely squamose, first visible sternum slightly convex at middle, fifth visible sternum approximately 0.6 X as long (measured along midline of abdomen) as wide. Genitalia: (Figs. 9, 35) tergum 8 broadly rounded dorsally, roughly conical in shape, rounded and setose apically, sternum 8 (spiculum ventrale) broadly shovel-shaped in distal quarter, setose apically; coxites conical, narrowing apically in dorsal view; styli with 2 setae at apex; pair of crescent-shaped sclerites present in bursa copulatrix.

Life History Data .— Nothing is known of the life history of this weevil.

Geographical distribution .— This species is known only from the Goose Lake area, Modoc Co. California (Map 5).

Phylogenetic relationships .— *P. acutisetus* is the postulated adelphotaxon of *P. oregonensis* (Fig. 79).

Chorological affinities .— See this topic for *P. oregonensis* above.

Material examined .— Only the holotype specimen listed above.

Subgenus *Phymatinus* LeConte

Phymatinus LeConte 1869-382. Gender masculine. Type species *Panscopus (Phymatinus) gemmatus* (LeConte), by monotypy. LeConte 1874:453. Horn 1876:53. LeConte and Horn 1883:444.

(Phymatinus) . Pierce 1913:392. Leng 1920:312. Buchanan 1927:27. Schenkling and Marshall 1931:39. Buchanan 1936:8. Blackwelder 1939:66. Kissinger 1964:36.

Panscopidius Pierce 1913-394

Panscopideus Blackwelder 1939-66 (error)

(Nocheles) . Buchanan 1927:28. Schenkling and Marshall 1931:40. Buchanan 1936:8. Ting 1938:121. Blackwelder 1939:66.

Derivation of name .– The name *Phymatinus* probably comes from the Greek word *phyma,* or *phymatos,* meaning tumor, or swelling, and the Latin suffix *-inus* meaning likeness, or belonging to. This is probably in reference to the shiny round tubercles on the dorsum of adult specimens of *P. gemmatus* .

Diagnosis .– Members of this subgenus are distinguished by the following combination of characters: scape long, extended to, or beyond middle of eye, beyond posterior margin of eye in most species; females with four visible abdominal sterna, or if five sterna present (*P. gemmatus*), then elytra and pronotum exhibit large round shiny black tubercles. Males of all species in this subgenus have the apex of aedeagus extended into a broad, dorso-ventrally flattened projection.

Included species .– *P. gemmatus, P. longiscapus, P. squamosus* , and *P. michelbacheri*

Phylogenetic relationships .– *Phymatinus* is the adelphotaxon of *Nomidus* .

Panscopus (Phymatinus) gemmatus (LeConte)
(Map 6, Figs. 10, 36, 59, 75)

Tyloderes gemmatus LeConte 1857 :56. Lacordaire 1863 :159 (footnote). LeConte 1869 :381. LeConte 1874 :456.

Phymatinus gemmatus LeConte 1869 :382. Horn 1876 :54.

Panscopus (Phymatinus) gemmatus . Pierce 1913 :391,392. Leng 1920 :312. Buchanan 1927 :27. Schenkling and Marshall 1931 :39 (catalog). Buchanan 1936 :8. Blackwelder 1939:66. Van Dyke 1935 :10.

Panscopus gemmatus . Hatch 1971 :388. O'Brien and Wibmer 1982 :62.

Type Material — Holotype (MCZ No. 8415) in LeConte collection. This specimen bears no specific locality, date, or collector information, but a dark blue label indicates it was collected in Washington or Oregon.

Notes about type material .— LeConte (1876) indicated the geographical distribution of this species as "Occurs in California and Oregon", suggesting

that he had not at that time seen specimens from Washington. Given the colour coded label on the holotype indicating Washington and Oregon, the type specimen was likely collected in Oregon.

Derivation of specific epithet .— The specific epithet is derived from the Latin word *gemma* meaning bud, precious stone, or jewel, plus the suffix *-atus* to create an adjective meaning "jewelled", undoubtedly referring to the jewelled, or sequined appearance of this weevil when the vestiture of metallic green scales is observed under magnification.

Recognition .— The larger size, the shiny tubercles on the pronotum and elytra, as well as the vestiture of metallic green scales distinguish specimens of *P. gemmatus* from representatives of all other *Panscopus* species.

Description : Size: ♀♀:Length, 8.3-11.2mm (mean=10.1, n=10); ; width across elytra, 3.3-4.2 mm(mean=3.9, n=10); ♂♂: Length, 8.7-10.9 mm (mean=9.8); width across elytra, 3.0-3.7 mm (mean=3.3, n=10); (other measurements, Table 10) Head: slight depression between eyes, at base of frons; rostrum parallel-sided in dorsal view, from frons to point of articulation of antennae, thence wider distally; thin median longitudinal carina extended length of rostrum. Antenna: scape extended to middle of eye when laid close to rostrum, scape vestiture of slightly flattened, blunt ended, appressed setae, directed apically, integument clearly visible among setae, funicle with sparse vestiture of thin acute, decumbent setae, integument clearly visible. Pronotum: wider than long; median longitudinal sulcus shallower posteriorly, deeper and wider anteriorly; dorsal surface with shiny round tubercles, each tubercle with seta at apex; vestiture of densely distributed striate metallic-coloured scales covering integument, but for tubercles. Elytra: together broadly oval in shape and wider than pronotum; posterior declivity of elytra reflexed, sloped slightly antero-ventrally at apex; in lateral view, odd-numbered elytral intervals raised, with rows of shiny rounded tubercles projected from them, each tubercle with slightly flattened, blunt-ended, decumbent seta projecting from apex, few such tubercles on even intervals, not in continuous rows as in odd-numbered intervals; elsewhere, integument of elytra densely covered with striate, appressed, overlapping scales, cupreous to pale green in colour. Legs: tibia 1 and 2 with row of thin spines on ventro-lateral margin, in distal 1/2 to 2/3, tibia 3 without such spines, corbellar area closed at apex of tibia 3. Abdomen: Five sterna visible in females, first and second visible sterna convex; in males first sternum concave medially, second sternum nearly flat or with slight concavity. Genitalia: ♀♀: (Figs. 10, 36) Tergum 8 broadly convex dorsally and conical apically, sternum 8 (spiculum ventrale) with apical expansion broadly spade-shaped, convex ventrally, and rounded at apices, cleft medially in apical portion, with fine setae posteriorly, Coxites 1 and 2 broadly angular in dorsal and ventral views, rounded at apex in lateral view, styli with three or four setae apically, bursa copulatrix with pair of crescent-shaped sclerites internally, near confluence of common oviduct, spermatheca smooth, sickle-shaped, broadly thickened in basal 2/3, narrowed apically. ♂♂ : (Figs. 59, 75) aedeagus with median lobe decurved, concave ventrally; apex with broad flat projection, narrow and acute in lateral view; manubrium of tegmen approximately as long as median lobe; median struts of aedeagus nearly 1.5X length of median lobe,

internal sac membranous with small, sclerotized structures comprised of a small v-shaped sclerite with broadly rounded lateral lobes, in ventral or dorsal view.

Life history data .— I have seen one record of a specimen which was taken from duff under Douglas Fir, 15th of March, 1972, in Oregon, which might suggest that imagos overwinter. Other than this, nothing is known of the life history of these weevils.

Host Plant Associations .— Table 11 lists records of host plants from which adult specimens of *Panscopus gemmatus* have been collected. Adults of this species have been taken from plants of nine genera representing four families of dicotyledonous angiosperms, as well as two genera of coniferous gymnosperms. Most of the plants listed are woody shrubs of the families (listed in order of greatest diversity represented in Table 11) Rosaceae, Ericaceae, Aceraceae. By number of specimens known to have been taken from each of these plant taxa, the greatest number have been taken from rosaceous shrubs (60% of records), with the genus *Rubus* accounting for 55 per cent of host plant records for this species. These records suggest that adults of *Panscopus gemmatus* are able to feed on the foliage of a wide variety of plants, or, perhaps, they are using the plants for purposes other than feeding. Possibly the leaves of such plants provide suitable perches for mate-finding. These records suggest a preference for woody plants over herbaceous plants. Records from label data include also specimens having been taken from under bark of a *Tsuga* stump, and "on weeds". One specimen label reads "willow and alder", which would add one more family , either Salicaceae or Betulaceae, to the list in table 11, if I knew from which of alder or willow this specimen was taken.

Geographical Distribution .— This species occurs in the Pacific region, in coastal moist forests from the Queen Charlotte Islands and Vancouver Island in British Columbia south through western Washington and Oregon (Map 6). The few altitude records available are between sea level and 900 metres

Phylogenetic relationships .— *P. gemmatus* is the postulated adelphotaxon of the common ancestor of *P. longiscapus, P. squamosus* , and *P. michelbacheri* (Fig. 79).

Chorological affinities .— The range of this species is overlapped with the combined ranges of *P. longiscapus, P. squamosus* , and *P. michelbacheri* (Maps 6 and 7).

Material Examined .— More than 740 specimens were examined, as follows:
CANADA:
British Columbia:Engelwood,31-Aug-49,?,Hemlock,1,(CNCI); Queen Charlotte Islands: Clayoquot Arm,1-Aug-51,F. I. S. 1951,Hemlock ,1,(CNCI); Graham Island, 5.6 km E Rennell Sound,8-Jul-84,R.S.Anderson,*Menziesia*, 2,(RSAN); Juskatla,7-Jul-59,F. I. S. 1959,Hemlock ,1,(CNCI); Kwuna Point,19-Aug-46,M.G.Thomson,2,(CASC); Kwuna Point, Sandspit,26-Jun-46,M.G.Thomson,1,(SMDV); Mesachie Lake,200m,16-Jul-80,H.&A.Howden,3,(HAHC); Moresby Island, Mosquito Lk. Cpgd.,4-Jul-84,R.S.Anderson,*Rubus parviflorus* ,9,(RSAN), 1,(CNCI), 1,(CWOB); Vancouver Island: Parker Creek,23-May-49,G.S.Brown,1,(SMDV); Parker Creek, 23-May-49,J.M.Kinghorn,19,(SMDV); Port Hardy,30-May-47, J.O.Little, *Tsuga heterophylla* ,5,(SMDV); Port Renfrew,23-Jul-46,H.E.Vey,1,(SMDV); Port

Renfrew, 1-Jun-49,?, Hemlock,1,(CNCI); Port Renfrew,2-Jun-49, F. I. S. 1949, Hemlock P49-296,1,(CNCI); Victoria,1-Aug-43,?,1,(SMDV); Victoria,9-Jul-50, I.Radcliffe, 1,(SMDV);

UNITED STATES OF AMERICA:

Oregon: ?, 1,(CMNH); H.C. Fall coll'n, 1,(MCZC); Benton Co.: Alsea,4-Jun-22, A.L.Lovett, 2,(OSUO); Blodgett,11-May-47,Borys Malkin,2,(FMNH); Blodgett,27-Jun, Darlington,1, (MCZC); Corvalis, 13 km N:McDonald Forest,27-Jun-73,Loren Russell,1,(USNM); Corvallis,13-Mar-35,K.Gray,1,(AMNH); Corvallis,2-Jul, B.G.Thomson, 1,(CWOB); Corvallis,13-Jul-87,R. Rosenstiel,1,(CWOB); ,Mary's Peak, 4-Jun-14, Van Dyke collection,1,(CASC); McDonald Forest, Sec4 T1S R5W, 19-Jul-74, R.L.Westcott, 1,(CWOB); Philomath, 13 km W.,12-May-83, D. S. Chandler, sweep, vegetation, 2,(CWOB); Philomath,21-Jun-39, F.G.Aitken, 1,(AMNH); Clackamas Co.: Alder Creek,8-Jul-27,"Darl." Darlington?", 1,(MCZC); Eagle Creek Post Office,4-Jul-40, K.Gray, J.Schuh, 2,(CWOB); Clatsop Co.: Astoria,25-May-?, 3,(CMNH); Astoria,25-Jun, Liebeck, 4,(MCZC); Astoria,25-Jun,Hubbard & Schwarz,1,(MCZC); Astoria,25-May,Horn coll. H 8277, 4, (MCZC); Astoria,25-May-,H.W. Wenzel,3,(OSUC); Astoria,24-May, Hubbard & Schwarz, 32,(USNM); Cannon Beach,E.C.Van Dyke:9-Jun-27, 1,(CASC), 11-Jun-27, 62,(CASC), 13-Jun-27, 5,(CASC), 14-Jun-27, 10,(CASC), 5, (CASC), 17-Jun-27, 8,(CASC), 18-Jun-27,1,(CASC); Olney,15-Jun-25, Van Dyke collection, 9,(CASC); Saddle Mtn.,17-Jul-69,K.J. Goeden, 2,(ODAC); Saddle Mtn.St.Pk.,26-Jun-65, M.C.Lane, 5,(OSUO); Seaside,31-Jul-58, M.C.Lane, 4,(OSUO); Seaside,27-Jun-33,E. L. Sleeper coll'n,1,(USNM); Warrenton,13-Aug-57,Ken Goeden,willow and alder,1,(ODAC); Columbia Co.: Goble, 22-May-38, K.Gray & J.Schuh, 1,(CWOB); Scappoose,29-May-45, Anderson,on weeds, 1,(USNM); Coos Co.: Coos Bay, Borys Malkin, 10-Sep-51, 1,(FMNH), 23-May-47, 1,(FMNH), 9-10-Jul-51, 1,(OSUO); Douglas Co.: Gardiner, 16 km E: Smith River, Otter Slough,27-May-64, J.D.Vertrees, 1,(AMNH); Reedsport, 20-Jun-39, T.G.Aitken, 14,(AMNH); Lane Co.: Florence, 12-Jun-36, Van Dyke collection, 2,(CASC); Florence,10-Jul-14, Wickham collection, 1,(USNM); Florence, 11 km N.,3-May-62,Vertrees, Carter et al, 1,(CWOB); Florence, 11 km S: Siltcoos Beach,3-May-62,Vertrees, et al, 1,(AMNH); Glenada,Borys Malkin:24-May-47,1,(FMNH), 14-Sep-41, 2,(FMNH), 20-Jul-41, 1,(FMNH), Jun-Jul-51,1,(OSUO); Triangle Lake,16-Jun-52,Borys Malkin, 4,(FMNH), 3,(OSUO), 19-May-8-Jun-57,1,(FMNH),2,(OSUO); Lincoln Co.: Cape Perpetua, 11-Jun-51, Borys Malkin, 1,(FMNH); Depoe Bay,21-May-65, M. C. Lane, 1,(OSUO); Newport,24-May-67, Brown & Goeden, resting on pine, 1,(ODAC); Otis,21-May-65, M.C.Lane, 12,(OSUO); Otis, 12-Apr-42, R.E. Rieder, 2,(CWOB); Siletz,12-Jun-63, N.L.H.Kraus, 1,(USNM); Tidewater,Joe Schuh: 21-Jun-35, 1,(AMNH), 1-Jul-34, 1,(CWOB); Tidewater, 20 km E.,6-Jul-73, R.L. Penrose, 1,(ODAC); Toledo, 24-Jul-28, J.E.Davis, 1,(AMNH); Toledo,9-Aug-09, Moznette, 1,(MCZC); Waldport: 22-Jun-30, J.E.Davis, 1,(AMNH), 1,(CWOB); Waldport, 5-Jun-25, E.C.Van Dyke, 1,(CASC); Waldport, 6-Jun-25, E. P. Van Duzee, 1,(CASC); Waldport,?,?, 1,(OSUO); Lincoln Co.,?, 10-May-41, F.W. Nunenmacher, 1,(FMNH); Linn Co.: Silver Creek, 3-Aug-49, ?, 1,(OSUO), 1-Aug-48, ?, 1,(OSUO); Marion Co.: Silver Creek Falls (Silver Falls?), 29-May-38, K.Gray & J.Schuh, 1,(AMNH), 1(USNM), 1,(CWOB); Silver Creek Falls,8-Jul-49, ?, 1,(OSUO); Silver Falls State Park, 23-Jun-39, M.A.Cazier collection, 16,(AMNH); Stayton, 7-May-62, F. Beck, pear tree, 2,(OSUO); Niagara Park,23-

Apr-72, R. L. Westcott, *Acer macrophyllum* , 1,(CWOB); Multnomah Co.: Gresham, 26-Apr-45, Joe Schuh, raspberry, 2,(CWOB), 1,(NMDC), 3,(UAIC), 1,(USNM); Horsetail Falls, 35 km E of Portland, 19-Apr-67, Kenneth Goeden, sweeping thimbleberry, *Rubus parviflorus* , 3,(ODAC); Portland,9-May-41, Schuh & Gray, *Acer macrophyllum* , 4,(CWOB), 2,(CNCI), 1,(NMDC), 2,(UAIC), 1,(USNM); Portland,28-Jun-27, E. C. Van Dyke, 1,(CASC); Portland,11-May-55, V. Roth,"Indian peach",*Oemleria cerasiformis* , 2,(ODAC); Portland,22-May-19?, Hubbard & Schwarz, 2,(USNM); Portland,?-May-04, F.H.Shoemaker, 1,(USNM); Polk Co.: Buell, 6.6 km S, 7-Jul-74, R.L. Penrose, 1,(ODAC); Tillamook Co.: Austin Ck, Little Nestucca River, 16-Jul-73, W. Wittmer, 3,(CWOB); Oswald West St. Pk., 8 km N Nehalem, 14-Aug-61, David R. Smith, Salal, 1,(OSUO); Blaine, 11 km E: For.Ser.Rd.533: Suislaw Nat. For., 15-Mar-72, E.M.Benedict, duff under Dougl. Fir, 1,(HAHC); Cape Lookout, 19-Jul-82, R.L. Westcott, 1,(ODAC); Cape Lookout, 10-Jul-77, R.L. Penrose, dead Hemlock, 1,(ODAC); Cape Lookout, 24-Jul-55, H.A.Hacker, 2,(UMAA); Cape Lookout, Kiwanda Viewpt. 4 km N,2.4 W Sand Lk., 4-Nov-72, Benedict, 1,(HAHC); Cascade Head Exp. For., 24-Jun-61, S.L. Wood et al, 1,(CWOB); Flowerpot Ck, ridge to NW,Sec.8,T1S,R10W, 17-Jul-82, R.L. Westcott, 5,(ODAC), 11,(RSAN); Garibaldi, 6-Apr-40, K.Gray & J.Schuh, 1,(USNM); Hemlock, 5-Apr-49, ?, 1,(OSUO); Nehalem,31-May-57, F.P.Larson, "caneberries", 1,(ODAC); Sand Lake, 7-Apr-40, DM & KM Fender, 1,(NMDC); Tierra Del Mar, 18-Apr-49, ?, 1,(OSUO); Tillamook, 22-May-35,?, 1,(CNCI); Tillamook, 27-Mar-19, A.C.Burrill, 1,(USNM); Washington, Co.: Cornelius Pass, N side, 19.3 km NW Portland,18-Jun-68, Kenneth Goeden, Thimbleberry, 1,(CWOB); Yamhill Co.: Carlton-Meadow Lake, 5-Jun-42, K.M.Fender, 2,(OSUO); Grande Rhonde Agency, 13.5 km W.,3-May-72, R.L.Penrose, 1,(CWOB); "OR",?,1,(MCZC); "Oregon",?,Wickham collection, 1,(USNM); OR,?,6-May-39, A. T. McClay coll'n, 1,(UCDC); Unknown County: Boyer, K.M. & D.M. Fender, 28-May-39, 8,(OSUO), 4-Jul-38, 2,(OSUO); Boyer, 4-Jul-38, E. W. Jones, 3,(UICM); DeLake, 5-May-39, M.C.Lane, 2,(OSUO); Hauser, 6-May-39, A. T. McClay, 1,(UCDC); Hauser, 6-May-39, L.G.Gentner, 3,(USNM); Imault, 30-May-14, Van Dyke, 1,(HAHC); Klanawa River, 2-Aug-48, J.M.Kinghorn, *Picea sitchensis* , 1,(CNCI); Little Nestuca River, 23-Jun-40, Kenneth M. Fender, 3,(CASC), 3,(UCDC); Little Nestuca River, 23-Jun-40, Borys Malkin, 1,(FMNH); Little Nestuca River, 23-Jun-40, ?, 22,(NMDC); Marshfield, Van Dyke, 11-Jun-14, 5,(CASC), 2,(CNCI), 3,(CUIC), 1,(HAHC), 5,(ISUI), 6,(MCZC).12-Jun-14, 2,(CASC), 14-Jun-14, 11,(CASC), 1,(OSUO); Marshfield, 14-Jun-14, Blaisdell collection, 10,(CASC); Morner?, ?, J.Ferguson, 1,(LACM); "Or", E. C. Van Dyke, 1,(MCZC); Washington: Clallam Co.: Forks, 5-Jul-20, E.C.Van Dyke, 22,(CASC); Forks, 2-Jul-20, Van Dyke collection, 3,(CASC); Forks, 4-Jul-20, E. P. Van Duzee, 15,(CASC); Klahowya St. Pk.,Soleduck R., Olympic Natl. For., 30-Jun-74, Paul H. Arnaud, Jr., 1,(CASC); Sol Duc Hot Springs, 20-Jun-36, Van Dyke collection, 2,(CASC); Clark Co.: La Centre, 18-May-79, D.C.?, Cascade berries, 1,(WSUC); Grays Harbor Co.: Copalis Beach, 7-Jun-61, 1,(OSUC); Hoquiam, 27-May-14, Van Dyke collection, 3,(CASC); Hoquiam, 29-Apr-04, Burke,*Tsuga heterophylla* , 1,(USNM); Hoquiam, 26-May-05, Burke, *Tsuga heterophylla*, 1,(USNM); Hoquiam, 27-Apr-04, Burke, Huckleberry, 3,(USNM); Hoquiam,?, Burke, 1,(USNM): Hoquiam, 5-Jul-04, Burke, under bark, *Tsuga* stump, 2,(USNM); Hoquiam, 29-Apr-04, Burke, Huckleberry, 1,(USNM); Hoquiam, 27-Apr-04,

Burke,Huckleberry, 2,(USNM); Hoquiam, 2-May-04, Burke, Huckleberry, 1,(USNM); Hoquiam,?,Burke,*Acer circinatum* , 1,(USNM); Hoquiam, 13-May-04, Burke,*Tsuga heterophylla* , 2,(USNM); Humptulips,28-May-14, E. C.Van Dyke, 12,(CASC); Humptulips, 29-May-14, E. C. Van Dyke, 5,(AMNH), 16,(CASC), 8,(CWOB), 6,(HAHC), 3,(INHS), 1,(MCZC), 1,(NMDC), 3,(OSUC), 1,(TAMU), 10,(USNM); Humptulips, 29-May-14, Blaisdell collection, 9,(CASC); Humptulips, 23-Jul-38, Van Dyke coll'n, 1,(CASC); Lake Quinault, 18-Jun-36, Van Dyke collection, 3,(CASC); Ocosta, 26-May-44,"GMH, GFP","cherry leaf, *Prunus* sp.", 1,(USNM); Quinault, D.J. & J.N. Knull,8-Jul-60, 5(OSUC), 11-Jul-60, 6(OSUC), 14-Jul-60, 6(OSUC); ,Quinault,W. W. Baker,10-Oct-33, ,2(UCDC),17-Oct-34, 1(UCDC); Jefferson Co.: Hoh River forest, 20-Aug-68, Bob Thomson, 1 (OSUO); Olympic Natl. Pk., Hoh River, 18-Jul-53, K.M.Fender, 2,(OSUO); Olympic Natl.Pk. 2.1km NE hwy 101, Queets R Rd., 25-Jun-87, T.Spanton&B.Brown,*Rubus parviflorus* , 24,(TGSC); Olympic Natl. Pk. 2.1 km NE hwy 101, Queets R. Rd.,22-24-Jun-87, B. Brown, mushroom baited trap,1, (TGSC); Lewis Co.: Doty, 6.4 km W., 22&23-Aug-70, R. L. Westcott, *Acer circinatum* , 5,CWOB; Pacific Co.: Bay Centre, 6-Aug-31, 1,(OSUO); Bay Centre, 17-Jul-31, 1,(OSUO); Bruce Port Park, 4-May-57, M.H.Hatch, 4,(OSUO); Ilwaco, 26-May,?, 1,(USNM); Ilwaco, 6-Jun-18, A.Spuler, 2,(WSUC); Nasel River, 4-Aug-30, 9-Sep-29, ?, 2,(OSUO); South Bend, Jul-1898 ,M.Laugallis, 1,(WSUC); Pierce Co.: Electron, 21-Jul-36, Van Dyke collection, 7,(CASC); Electron, 4-Jun-33, Wm.W.Baker, 1,(CNCI); Electron, J.Wilcox, 2-Jun-33, 4,(OSUO), 14-May-33,1,(OSUO); Electron,23&24-Jun-33, S.E.Crumb, 2,(OSUO); Mt. Rainier Natl.Pk., Longmires, 13-Jul-36, Van Dyke collection, 12,(CASC); Skamania Co.: Carson, 4-May-52,?, 1,(OSUO); N.F. Cipsus R., 25-Jun-34, J.L.Wilcox, 1,(OSUO); Taklakh Pond, 24-Jun-34, J.L.Wilcox, 1,(OSUO); Localities of unknown counties: Blue Lake, Jun-31, Jim Bassett, truck crop #1340, 1,(USNM); Capalla Beach(sic) [Copalis Beach?], 16-Jun-36, Van Dyke collection, 4,(CASC); Columbia Natl. For., 7-Jun-12, N.Dearborn, 1,(USNM); "Morrison, Wash Terry",?, Hubbard & Schwarz, 1,(USNM); Olympic National Forest, 19-Jul-58, D.J. & J.N. Knull, 3,(OSUC); Rainier Natl.Pk. Tahoma creek 900 m, 20-Jul-35, M. C. Lane, 1,(OSUO); Riffe, 15-May-32, Wm.W.Baker, truck crop #1445, 1,(USNM); "W.T."[Washington Territory?]", Nason coll'n, 1,(INHS); "W. T.", 3,(MCZC);
Doubtful records: "Cal.",LeConte coll'n,1,(MCZC).

Panscopus (Phymatinus) longiscapus **new species**
(Map 7, Figs. 11, 37, 60)

Panscopus (Nocheles) torpidus . Pierce 1913 :390. Leng 1920 :312. Buchanan 1927 :28. Schenkling and Marshall 1931:40. Buchanan 1936:9. Ting 1938:122,123. Blackwelder 1939:66.

Panscopus torpidus . Hatch 1971 :289. O'Brien and Wibmer 1982 :63.

Type material .— Holotype ♀, Allotype ♂, and 27 Paratypes bear the label data: "Olympia/Wash./VII-28-28; Pres by/Thos Craig/ Collector" (CASC).

Notes about synonymy .— The holotype of *Hylobius torpidus* LeConte 1857: 21, is a specimen of the species which has been recognized as *Panscopus pallidus* Buchanan 1927 , by Buchanan (1936), Hatch (1971) and O'Brien and Wibmer (1982). Thus the name *Panscopus pallidus* Buchanan

1927, is a junior synonym of *Panscopus (Nomidus) torpidus* (LeConte 1857). See the discussion under that species name. Thus this species,*Panscopus (Phymatinus) longiscapus* is described as new..

Derivation of specific epithet .— The word longiscapus comes from the Latin *longus*, meaning long, and *scapus* , meaning stem or staff, referring to the elongated scape of the antenna which is longer, proportionately, in this species and others in this subgenus than in other species of *Panscopus* .

Diagnosis .— Most specimens of this species are recognized by the following combination of characters: scape long, reaching hind margin of eye; four visible sterna in abdomen of females, alternate elytral intervals distinctly costate, elytral setae thin, but flattened; even intervals nearly non-setose; colour black to cinereous. In addition, males exhibit a field of spicules in internal sac, distad to belt of tegmen, and a v-shaped pair of sclerites in the internal sac (Fig. 60).

Description .— Size : ♀♀ : length 8.1-9.9 mm (mean=8.8, n=10), width across elytra 3.4-4.1 mm (mean=3.6, n=10); ♂♂ : Length 7.7-9.4 mm (mean=8.4, n=10), width across elytra 3.0-3.6 mm (3.3, n=10); (other measurements, Table 12). Colour : very dark brown to black, with areas of medium or light brown scales posteriorly and laterally, on elytra. Head : transverse concavity at base of frons nearly absent - rostrum and frons apparently continuous in lateral view; rostrum with thin, shiny longitudinal median carina and lateral sulci indistinct dorsally, in apical portion, in most specimens; nasal plate not clearly defined from punctate surface of rostrum, v-shaped carina on nasal plate; vestiture of frons and rostrum of scattered decumbent to appressed setae. Antennae: scape as long as, or longer than rostrum; scape extended to or beyond hind margin of eye; scape vestiture of apically directed reclinate setae, integument visible among the setae; all funicular annuli with long primary setae on distal half of annulus and scattered, shorter, finer, setae; shiny integument clearly visible through thin vestiture. Pronotum : slightly wider than long, roundly convex laterally, widest slightly anterior of middle; surface coarsely rugose-tuberculate; median longitudinal sulcus nearly length of pronotum; vestiture dorsally of scattered, decumbent to appressed setae, located at apices of low rounded tubercles, scales absent, or nearly so, dorsally; laterally some scattered, appressed, striate scales present. Elytra : elongate oval, combined width 1/3 to 1/4 wider than pronotum; declivity, in lateral view nearly vertical in males, reflexed in females; alternate intervals raised, with irregular, double to partly triple row of decumbent, thin setae, serial pits each with scale only slightly larger than surrounding scales; elsewhere, vestiture of dense, overlapping, appressed, striate scales. Legs : tibiae 1 and 2 with small denticles on ventral margin, in distal half, setae emanating therefrom not markedly stiffened and spine-like, in most specimens; tibia 3 without spines on ventral margin apically, corbellar area indistinctly closed at apex of tibia 3. Abdomen : four sterna visible in females (two apical sterna fused); five sterna visible in males; sternum 1 convex at middle in females, concave at middle in males. Genitalia : ♀♀ : (Figs. 11, 37) sternum 8 (spiculum ventrale) with apical expansion broadly rounded apically, convex ventrally and wide and shovel-shaped, cleft medially, with thin setae near apex; coxites 1 and 2 broadly angular, narrowed apically in dorsal or ventral view, rounded apically in lateral

view; styli each with two or three primary setae at apex; bursa copulatrix shorter than length of coxites, membranous, with pair of broadly crescent-shaped sclerites near confluence of common oviduct ; spermatheca sickle-shaped, thick over most of its length. ♂ ♂ : (Fig. 60) aedeagus with median lobe greatly decurved, convex dorsally, concave ventrally, in retracted state; apex with broad, flat, spatulate projection, in dorsal view, narrow and acute in lateral view; manubrium of tegmen approximately as long as median lobe; median struts of aedeagus slightly longer than median lobe; internal sac membranous with small pair of sclerotized structures near apex of sac (anteriorly in inverted sac).

Life History Data .— Label data indicates that most adults have been found in the months of March through October. Isolated records are from the months of February, November, and December, the latter two records from "duff" or "litter".

Host plant associations .— I have seen records of specimens being taken from alder, dandelion, red clover, strawberry, as well as hemlock duff, oak litter, vine maple duff, and on moss near logs.

Geographical distribution .— This species is known to occur in the southern mainland of British Columbia (Vancouver), and in moist forest regions of western Oregon and Washington (Map 7). Of the few altitude records available, the highest are 950 - 1,070 metres.

Phylogenetic relationships .— *P. longiscapus* is the postulated adelphotaxon of the common ancestor of P. *squamosus* and *P. michelbacheri* (Fig. 79).

Chorological affinities .— The ranges of this species and *P. squamosus* and *P. michelbacheri* are adjacent to one another but non-overlapping (Map 7).

Material examined .— In addition to the type specimens listed above, approximately 240 specimens have been examined.
CANADA:
British Columbia: "B.C. V." (Vancouver?), 4-Jul-37,?,1,(OSUO).
UNITED STATES OF AMERICA:
Oregon: Benton Co.: "Campus" (OSUO campus, Corvallis?),?,?,1,(OSUO); Corvallis, 12-Jun-33, J. Schuh, 2,(AMNH); McDonald Forest, N. of Corvallis, 3-Nov-49, V. Roth, 1,(OSUO); Clackamas Co.: Larch Mountain nr. mt Hood Natl. For, nr Sandy, 27-Sep-72, E. M. Benedict, hemlock duff, 1,(HAHC); Larch Mtn., 14.5 km N, 9.7 km E, Sandy. 700 m, 27-Sep-72, E. M. Benedict, hemlock duff, 5,(HAHC); Clatsop Co.,Birkenfeld, 8 km SW, 30-Oct-60, R. H. Heitmanek, rotten wood & ground litter, 6,(OSUO); Cannon Beach, 15-Jun-27, E. C. Van Dyke, 1,(CASC); J.J. Astor Expt. Sta., 29-Sep-60, E. Dickason, moss on logs, 1,(OSUO); Olney, 9.7 km SE, 21-Nov-71, E. M. Benedict, duff, 1,(HAHC); Columbia Co.: Goble,18-May-38, Gray & Schuh, 2,(AMNH); Goble, 22-Apr-38, K. Gray & J. Schuh, (Emergence cages), 1,(USNM); Old Pittsburg Rd., 11.3 km E, 0.8 km S, Pittsburg,15-Apr-72,E. M. Benedict,1,(HAHC); Douglas Co., Reedsport, 20-Jun-39, T. G. Aitken, 1,(AMNH); Jackson Co., Union Creek 950-1070 m, 1-15-Sep-50, B. Malkin, 1,(FMNH); Josephine Co.: Silver Creek Falls, 1-Aug-48, K. M. Fender, 1,(OSUO); Lane Co.: Eugene, 24-Jul-41, 8-Sep-41, Jul-41, B. Malkin,4,(FMNH); Junction City, 16 km NW,Sep-47, R. O. Mattus,

1,(FMNH); Spencer's Butte, Eugene, Jul-42, B. Malkin, 2,(FMNH); Linn Co.: Albany, 10-Aug-29, J. Wilcox, Strawberry, 1,(OSUO); Lacombe, 3 mi E., 13-Dec-57,?,Oak litter,1,(OSUO); Marion Co.: Mill Valley, 18-Jun-25, E. P. Van Duzee, 1, (CASC); Silver Falls State Park,23-Jun-39,M.A. Cazier coll'n, 3,(AMNH); Multnomah Co.: Gresham, 18-Apr-46, 7-Apr-47, Joe Schuh, Strawberry, 2,(AMNH); Portland, 22&23-May, Hubbard & Schwarz, 4,(USNM); Washington Co.: Garden Home, 23-May-19, L. P. Rockwood, 1,(USNM); North Plains, 23-Apr-59, Kenneth Goeden, forest duff, 1,(ODAC); Orenco, 4-Jun-45, Anderson, Alder, 2,(USNM); Pumpkin Ridge, 24-Apr-73, Westcott & Penrose, Red Clover, 2,(CWOB), 1,(ODAC); Yamhill Co.: Dayton, 3-Jun-42, 12-Apr-49, K. M. Fender, 2,(OSUO); Unknown counties: Barton Island Park, 0.8 km S Barton, 22-Apr-72, E. M. Benedict, Vine maple duff, 1,(HAHC); "Or.",(no locality, date or collector), 3,(ICCM).

Washington: Clallam Co., Forks,2-Jul-20, Van Dyke collection, 1,(CASC); Grays Harbor Co.: Humptulips, 29-May-14, Van Dyke collection, 1,(CASC); Montesano, 20-Mar-32, J. Wilcox, 2,(DEUN), 10, (OSUO); Montesano, 3-Apr-32, J. Wilcox, 2,(CNCI), 26,(OSUO), 1,(UCDC); Montesano, 8-May-32, J. Wilcox, 4,(OSUO), 5,(TAMU), 1, (UCDC); Montesano, 25-Feb-33, J. Wilcox, 5,(OSUO); Montesano, 14-May-33, J. Wilcox, 11,(OSUO); King Co.: Seattle, 9-May-07, Van Dyke collection, 5,(CASC); 10-May-53, 16-May-53, B. Malkin, 2,(FMNH); Seattle, 21-Apr-38, 9-May-38, 25-May-38, E. Dailey, 4,(OSUO); Seattle, 14-Apr-38,C. H. Lovers, 1,(OSUO); Seattle, 26-Jun-29, M. H. Hatch, 1,(OSUO); Seattle, 23-Apr-39, J. Stort?, 1,(OSUO); Seattle, 9-Apr-24, 6-Apr-25, 17-May-33, 2-Jun-33, ?, 6,(OSUO); Lewis Co., Lewis and Clark State Park, 5-Sep-59, K. M. Fender, 1,(OSUO); Pierce Co.: Puyallup, 8-May-39,S. Crumb, 1,(OSUO); Puyallup, 30-Apr-30, Wm. W. Baker, 5,(USNM); Puyallup, 21-May-31, Wm.W.Baker, 1,(UWEM); Summer, 23-Apr-53,?, 8,(USNM); Tacoma, 25-Apr-31, W. W. Baker, 1,(CUIC); Thurston Co., East Olympia, 11-May-45, Forsell, Dandelion, 1,(USNM); Olympia, 16-Mar-?, 10-Apr-?, 26-Jun-?, Liebeck collection, 9,(MCZC); Olympia, ?, Wickham collection, 4,(USNM); Olympia, 4-Sep-25, M.C.Lane, 1,(USNM); Rainier, 24-Apr-14, W.J. Chamberlain, 1,(USNM); Rochester, 3-Apr-31, 30-Mar-32, Wm. W. Baker, 2,(CNCI); Rochester, 19-Apr-30, Wm. W. Baker, 1,(CUIC), 2,(CUIC), 2,(UCDC), 7,(USNM), 1,(WSUC); Rochester, 19-Apr-1930, Wm. W. Baker, 1 (CUIC); Rochester,30-Apr-30,Wm.W.Baker,1,(UWEM); Rochester,3-May-30,Wm. W. Baker,2,(USNM); Unknown counties: WA,?,?,Van Dyke collection,1,(CASC); WA,,?,?,F.R. Eddy coll'n,1,(MCZC); "W. Ter.",20-Mar-1892,?,1,(USNM); "W.Ter."?,?,1,(USNM).

Panscopus (Phymatinus) squamosus Pierce
(Map 7, Figs. 12, 38, 61)

Panscopus (Panscopidius) squamosus Pierce 1913-394. Leng 1920:312.

Panscopus (Nocheles) squamosus . Buchanan 1927:28. Schenkling and Marshall 1931:40. Buchanan 1936:9. Ting 1938. Blackwelder, 1939:66.

Panscopus squamosus . Hatch 1971:289. O'Brien and Wibmer 1982:63.

Panscopus (Panscopidius) dentipes Pierce 1913-395. Leng 1920:312.

Panscopus (Nocheles) dentipes . Buchanan 1927:28. Schenkling and Marshall 1931:40.

Panscopus (Nocheles) squamosus dentipes . Buchanan 1936:9. Blackwelder 1939:66.

Panscopus squamosus dentipes . O'Brien and Wibmer 1982:63.

Type material .— Holotype, ♂, labelled: "Hilgard / Oreg.; Collection / Wickham ; Type/ No. 14640 / U.S.N.M.; Panscopus/ squamosus/ Type Pierce" [Union County].

I also examined the holotype of *P. dentipes* Pierce 1913, a male: Pullman, Washington, 13 April 94, J. W. Hungate collector; Type No. 14641 USNM.

Derivation of specific epithet .— The Latin word*squamosus* means scaly, from the root word *squama*, or scale.

Diagnosis .— Specimens of this species are recognized by the long scape extended to hind margin of eye, and females with four visible abdominal sterna, in combination with the following: elytral intervals even in elevation, or at most slightly elevated near base; elytral declivity in lateral view, describing a continuous curve to apex; elytral setae more appressed than decumbent, varying from broad and scale-like, to thin but flattened; colour cinereous.

Description .— Size : ♀♀ : Length 5.3-6.9 mm (mean=6.3, n=10); width across elytra 2.7-3.2 mm (mean=2.9, n=10). ♂♂ : Length 5.3-7.0 mm (mean=5.9, n=10); (other measurements, Table 13). Colour : grey-brown to dark brown, with irregular patches of grey scales and brown scales on elytra, integument, where visible through vestiture, rufo-testaceous. Head : transverse concavity at base of frons nearly absent- rostrum and frons apparently continuous in lateral view; rostrum and frons with shiny, thin, median longitudinal carina incomplete in some specimens, indistinct to absent in some specimens, lateral rostral carinae absent in most specimens, incompletely present in some; nasal plate indistinctly separated from dorsal surface of frons and rostrum, v-shaped carina present; vestiture of frons and rostrum of scattered decumbent to appressed setae, without clearly delineated clump of supra-orbital setae. Antennae: scape extended to or beyond hind margin of eye; scape vestiture of thin, apically-directed decumbent to appressed setae, integument clearly visible; funiculus with long primary setae present on distal portion of each annulus, and smaller, secondary setae scattered over surface, integument clearly visible. Pronotum : 1/5 to 1/6 wider than long, roundly convex on lateral margins, widest anterior to middle; surface coarsely rugose-tuberculate; median longitudinal sulcus thin, present the length of pronotum; vestiture of scattered, decumbent to appressed, flattened setae. Elytra : combined width approximately two-thirds of length in females, males slightly narrower; nearly 50 percent wider than the pronotum, in females, slightly narrower in males; declivity, in lateral view, rounded, posterior margin not reflexed past vertical; declivity in females broadly rounded in lateral view, posterior margin reflexed beyond vertical; intervals subequally convex, alternate intervals not greatly raised above level of even intervals; all intervals with irregular rows of decumbent to appressed, flattened setae; scales of serial pits elongate, not round, about size of surrounding setae; elsewhere with vestiture of dense, overlapping, appressed, slightly elongate, striate scales. Legs : tibiae 1 and 2 without obvious stiffened spines on ventral margin, in most

specimens; tibia 3 without obvious spines on ventral margin, in most specimens; corbellar area of tibia 3 indistinctly closed. Abdomen : four sterna visible in females (2 apical sterna fused); five sterna visible in males; sternum 1 convex at middle in females, concave at middle in males. Genitalia : ♀♀ : (Figs. 12, 38) sternum 8 (spiculum ventrale), as in *P. longiscapus* ; coxites 1 and 2 and styli as in *P. longiscapus* ; bursa copulatrix long, nearly twice length of coxites, membranous, with slightly crescent-shaped pair of sclerites anteriorly, near confluence of common oviduct ; spermatheca broad and thick over most of its length. ♂♂ : (Fig. 61) aedeagus decurved, with broad spatulate projection apically, as in *P. longiscapus*, manubrium of tegmen approximately as long as median lobe, without apical projection; median struts as long as median lobe including apical projection ; internal sac with pair of sclerites apically, joined together in form of inverted v-shaped structure; membranous sac with field of sclerotized denticles distal to belt of tegmen.

Life History Data .— Adult specimens have been collected in February, March , April, May, June, July and August. Nothing else is known of the life history.

Geographical distribution .— Weevils of this species are known to occur in the Blue Mtns. area of northeastern Oregon and eastern Washington, as well as in adjacent parts of western Idaho (Map 7). In the fomer area, these weevils are known to occur at altitudes between 1220 and 1830 metres.

Phylogenetic relationships .— *P. squamosus* is the postulated adelphotaxon of *P. michelbacheri* (Fig. 79).

Chorological affinities .— see this topic for *P. longiscapus* above (Map 7).

Material examined .— In addition to the holotype specimen mentioned above, approximately 55 specimens were examined.
UNITED STATES OF AMERICA:
Idaho: Latah Co.: Moscow, 31-Mar-32,T. A. Brindley, 1,(UICM); Valley Co.: Cascade, 23-Jun-39,?, 1,(USNM); Oregon: Umatilla Co.: Blue Mtns. Tollgate, 17-Jul-48, M. C. Lane, 5,(OSUO); Blue Mtns. Tollgate 1520 m,?, M. C. Lane, 17,(OSUO); Tollgate vic. Target Meadows 1520 m, 22-Jul-85, R. L. Westcott, 1,(ODAC); Tollgate, 8 km W., 1220 m, Roadside Meadow, 11-Jul-64, T. Schuh & J.D. Lattin, roadside meadow, 1,(DEUN); Blue Mtns., 11-Jun-40, K. M. Fender, 2,(USNM); Blue Mtns. 1830 m, 30-Aug-23, M. C. Lane, 4,(USNM); Blue Mtns. Bone Springs 1770 m, 26-Jun-36, 11-Jun-40,?, 2,(OSUO); Blue Mtns. Tollgate, 8-Jun-49, M. C. Lane,1,(OSUO); Tollgate Road, Blue Mtns.,7-Jun-38,Van Dyke coll'n., 1,(CASC); Washington: Walla Walla Co.: Walla Walla, 3-May-40, M. C. Lane, 2,(OSUO); Blue Mtns. Godman Springs 1680 m, 3-Jul-40, M. C. Lane, 5,(OSUO); Whitman Co.: Pullman,?,?, 2,(USNM); Pullman, 26-Apr-07,?, 1,(WSUC); Pullman, 10-Apr-56, Verne Newhouse, 1,(WSUC); Pullman , 5-Apr-13, M. A. Yothers, 1,(CASC); Pullman, 20-Feb-45, May, C. V. Piper, 3,(USNM); Unknown county: Boulder Cave, 13-May-49, C. E. Horner, 1,(OSUO). Assumed mislabelled: "Wyom./Cle Ellum/13.V.36" , 1, (FMNH).

Panscopus (Phymatinus) michelbacheri Ting
(Map 7, Figs. 13, 39, 62)

Panscopus michelbacheri Ting 1938:121. O'Brien and Marshall 1982:63.

Panscopus (Nocheles) michelbacheri . Blackwelder 1939:66

Type material .— Holotype ♂ (CAS No. 4594) "Nevada City / VI-27-37 Cal./ M. Cazier"and Allotype ♀ (CAS No. 4595) " Nevada City/ VI-27-37 Cal./ M. Cazier" from a type series of 64 specimens "collected under wood and other debris", by Dr. A. E. Michelbacher and M. A. Cazier (Ting 1938). Paratype material has been examined as follows: CA: Nevada Co.: Nevada City, 27-Jun-37,Michelbacher, 9,(AMNH), 3,(CASC), 1,(LACM), 4,(UCDC), 1,(USNM); CA:Nevada Co.:Nevada City, 27-Jun-37, M. Cazier, 5,(AMNH), 1,(CASC), 1,(LACM), 3,(UCDC), 3,(USNM); CA:Placer Co.:Emmigrant Gap, 13-Jun-37, M. Cazier, 1,(AMNH), 1,(CWOB), 1,(LACM), 1,(UCDC).

Derivation of specific epithet .— Based on the surname of A. E. Michelbacher, who along with M. A. Cazier, collected the type series (Ting, 1938).

Diagnosis .— Specimens of this species are recognized by the long scape extended to the hind margin of eye, females with four visible abdominal sterna, in combination with the following characters: elytral intervals even, or at most slightly elevated near base; elytral declivity, in lateral view , describing a continuous curve to apex ; elytral setae more decumbent than appressed, setae thin but flattened; black, or nearly so.

Description .— Size : ♀♀ : length 8.8-9.6 mm (mean=9.15, n=10); width across elytra 3.3-4.5 mm (mean=4.0, n=10). ♂ ♂ : length 7.8-9.7 mm (mean=8.5, n=10); width across elytra 2.9-3.5 m(mean=3.2, n=10); (other measurements, Table 14). Colour : dark grey-brown to black; integument, where visible through vestiture of antennae, legs and venter, rufescent. Head : transverse depression at base of frons a small concavity medially- frons and rostrum continuous in lateral view; with thin, shiny, median longitudinal carina; without lateral rostral carinae; nasal plate not differentiated from dorsal surface of rostrum; with v-shaped carina; vestiture of rostrum and frons of scattered appressed, elongate scales and scattered decumbent, flattened setae, loose group of 10-14 decumbent, flattened, blunt setae supra-orbitally. Antennae: scape extended to or beyond hind margin of eye when resting next to head; scape vestiture of thin, appressed, distally-directed setae, integument visible among setae; funiculus with long primary setae on distal portion of each annulus, as well as short, fine secondary setae scattered over surface, more densely on distal annuli; integument visible among setae. Pronotum : approximately one-fifth wider than long in females, narrower in males, roundly convex laterally; widest at middle; surface coarsely punctate; median longitudinal sulcus reduced, or present as faint depression in anterior third and posterior third, in many individuals; vestiture of scattered scales and flattened, blunt, appressed setae, integument visible through the vestiture. Elytra : combined width approximately three-quarters of length in females, slightly narrower in males, declivity rounded in lateral view, posterior margin nearly vertical in males, reflexed in females; intervals subequally convex, alternates not raised over level of even intervals, but for sutural interval, each interval with

irregular row of decumbent setae, serial pits each with slightly elongate scale; elsewhere vestiture of appressed, striate scales. Legs : tibiae 1 and 2 without obvious stiffened spines on ventral margins, in most specimens; tibia 3 without obvious spines on ventral margin; corbellar area of tibia 3 indistinctly closed. Abdomen : four sterna visible in females, five sterna visible in males; sternum 1 convex at middle in females, concave at middle in males. Genitalia : ♀♀ : (Figs. 13, 39) sternum 8 (spiculum ventrale) as in other species of *Phymatinus* ; bursa copulatrix long, membranous, with pair of crescent-shaped sclerites anteriorly near confluence of common oviduct; spermatheca sickle-shaped, tapered, in apical third, to thin apex. ♂ ♂ : (Fig. 62) aedeagus decurved, with a broad spatulate projection apically, as in *P. longiscapus* , and *P. squamosus* ; manubrium of tegmen approximately as long as median lobe, not including apical projection; median struts as long as median lobe including apical projection; internal sac with pair of sclerites apically, joined together to form inverted V-shaped structure, located anteriorly, in inverted sac; sac with field of small denticles distad belt of tegmen.

Life History Data .— Adult specimens have been collected in the months of March, May, and June.

Host plant associations .— Unknown.

Geographical distribution .— This species is known to occur in Alameda, Nevada, and Placer counties, California (Map 7).

Phylogenetic relationships .— *P. michelbacheri* is the postulated adelphotaxon of *P. squamosus* (Fig. 79).

Chorological affinities .— See this topic for *P. longiscapus* above.

Material examined .— In addition to the holotype and paratype material listed above, the following six specimens were examined:
UNITED STATES OF AMERICA:
California: Nevada Co.,?,12-May-62,L. Magarian,1,(CWOB), 2,(USNM); ?,12-May-62,Erwin #251&#255, 2,(CWOB). Plumas Co.: Quincy,?-Jul-22,Van Dyke Colln.,1,(CASC);

Subgenus *Nocheles* LeConte and Horn

Nocheles LeConte 1874:453 (nomen nudum)

Nocheles LeConte and Horn 1876:54 [not LeConte 1874], type species *P. torpidus* LeConte and Horn, designated by Pierce (1913)

Nomidus Casey 1895:818. Gender masculine. Type species *Nomidus abruptus* Casey (=*Panscopus (Nomidus) abruptus* (Casey)), by monotypy.

(Nomidus) . Pierce 1913:395. Leng 1920:312. Buchanan 1927:28. Schenkling and Marshall 1931:41. Buchanan 1936:14. Blackwelder 1939:66. Kissinger 1964:36.

(Neopanscopus) Pierce 1913-397. Buchanan 1927:28. Schenkling and Marshall 1931:40. Buchanan 1936:12. Blackwelder 1939:66. Kissinger 1964:36.

(Nomichus) . Blatchley and Leng 1916:104 (error).

(Nocheles). Kissinger 1964: 36.

(Nomidius) . Hatch 1971:290 (error).

Notes about synonymies.— The name *Nocheles* was first published by LeConte (1874: 453) where he included no description and no species were associated with it. The next use of the name was by LeConte and Horn (1876: 54) who included with it a description, and included the species *P. torpidus* (LeConte) and *P. aequalis* (Horn). The name of this subgenus was thus made available by LeConte and Horn (1876).

Derivation of name .– *Nocheles* is a Greek word meaning moving slowly, sluggish, in reference to the very slow-moving behaviour of many *Panscopus* species as well as many other broad-nosed weevils.

Diagnosis .– Scape short not extended to middle of eye when next to head; five visible abdominal sterna in females; males apex of aedeagus slightly angular in shape with a slight medial acuity (Figs. 63-73).

Included species .– *P. johnsoni, P. bakeri, P.longus, P. schwarzi, P. coloradensis, P. pallidus, P. ovalis, P. tricarinatus, P. bufo, P. abruptus, P. rugicollis, P. aequalis,* and *P. squamifrons* .

Phylogenetic relationships .– This is the most derived subgenus in the reconstructed phylogeny (Fig. 80), and is the postulated adelphotaxon of *Phymatinus* .

Panscopus (Nocheles) johnsoni Van Dyke
(Map 8, Figs. 14, 40, 63)

Panscopus johnsoni Van Dyke 1935-9. Hatch 1971:290. O'Brien and Wibmer 1982:63.

Panscopus (Nomidus) johnsoni . Buchanan 1936:14. Blackwelder 1939:66.

Type material .— Holotype ♂ (CAS No. 3924), "Humptulips/ Wash./ V-29-1914; Van Dyke/ Collection; Panscopus / johnsoni / Van Dyke; Holotype." (The word Holotype is printed across the end of the label, highlighted in red). Allotype ♀ (CAS No. 3934) "Humptulips/ Wash./ V-29-1914; Van Dyke/ Collection; Panscopus / johnsoni / Van Dyke; Allotype." (The word Allotype is printed across the end of the label, highlighted in red). Paratypes:"Humptulips/ Wash/ V-29-1914; Van Dyke / Collection; Panscopus / johnsoni / Van Dyke / Paratype". (The word Paratype is printed across the end of the label, highlighted in red), 4, (CASC), 1,(USNM), 1,(WSUC); "Humptulips/ Wash./ V-29-1914; Van Dyke / Collection", 2,(CASC). This accounts for eight of the nine paratype specimens mentioned by Van Dyke (1935: 10).

Derivation of specific epithet .— Van Dyke (1935: 10) named this species after his old friend Professor O. B. Johnson, who he described as "the pioneer entomologist of the Pacific Northwest".

Diagnosis .— Specimens of *P. johnsoni* are distinguished from other species of *Panscopus* by a short scape, not reaching beyond anterior quarter of eye, females with five visible abdominal sterna, in combination with the following characters: dorsal scales, at least in part, green; elytra without

tubercles; alternate elytral intervals costate; scape setose only, not squamose; rostrum slender, with thin median longitudinal carina.

Description .— Size : ♀♀ : Length 6.6 mm (n=1, estimated from specimen with detached head), width across elytra 2.69 mm (n=1). ♂♂ : Length 6.36-7.27 mm (mean=6.79, n=6); width across elytra 2.28-2.53 mm (mean=2.41, n=7); (other measurements, Table 15). Colour : grey or beige and light green. vestiture of scales arranged in large irregular patches of greyish beige, and pale metallic green or cupreous areas, integument, where visible through vestiture near joints of legs, antennae, and elsewhere, rufescent. Head : transverse depression at base of frons weak, frons and rostrum continuous in lateral view; rostrum non-carinate; nasal plate glabrous, without dense greenish scales present on rest of rostrum and frons; v-shaped carina indistinct; small group of six-eight slightly flattened, decumbent setae supra-orbitally; scape relatively short, extended to anterior quarter of eye when next to head. Antennae: scape vestiture of thin, decumbent, apically directed setae, rufescent integument visible through vestiture; funicular annuli with long thin primary setae on apical half of each annulus, and thin, fine, appressed secondary setae on each annulus, apically directed, shiny integument not concealed by setae. Pronotum : narrower, in proportion to length, than in other species of *Panscopus*, not more than one-tenth wider than long, on both males and females; sides less convex than other species of *Panscopus* ; deep longitudinal sulcus medially, in anterior third pronounced carinae bound sulcus, on either side; surface coarsely irregular, tuberculate; vestiture of dense, appressed, striate scales, some metallic green in colour, and reclinate setae, each at apex of tubercle. Elytra : combined width nearly two-thirds wider than pronotum in female, not quite one-third wider than prothorax in males; combined width approximately 70% of length in female, proportionately narrower in males; alternate intervals distinctly carinate, with row of decumbent, broad setae on each; even intervals flat and nearly non-setose; serial pits each with nearly round scale, larger than surrounding scales. Legs : tibiae without obviously stiffened spines on ventral margin; corbellar area of tibia 3 narrowly and indistinctly closed. Abdomen : five sterna visible in both females and males; sternum 1 concave at middle in males, slightly convex in females. Genitalia : ♀♀ : (Figs. 14, 40) sternum 8 (spiculum ventrale) with apical expansion small, approximately one quarter, or less, of total length of spiculum; shape as in other *Panscopus* species; bursa copulatrix long, with pair of crescent-shaped sclerites near anterior end . ♂♂ : (Fig. 63) aedeagus gently decurved, less so than in other *Panscopus* species; apex broadly rounded; ;manubrium of tegmen approximately as long as median lobe; median struts one-quarter longer than median lobe; internal sac membranous, finely granular distal to belt of tegmen, with group of acute, angular sclerites anteriorly, in inverted sac.

Life History Data .— Adult specimens have been collected in late May.

Geographical distribution .— This species is known only from Humptulips, Grays Harbor Co., Washington (Map 8).

Phylogenetic relationships .— *P. johnsoni* is the postulated adelphotaxon of *P. bakeri* .

Material examined .— I have seen only the type material listed above.

Panscopus (Nocheles) bakeri Buchanan
(Map 8, Figs. 15, 41, 64)

Panscopus (Nomidus) bakeri Buchanan 1936-17. Blackwelder 1939:66.
Panscopus bakeri . Hatch 1971:291. O'Brien and Wibmer 1982:63.

Type material .— Holotype ♂ (USNM No. 50649) Electron, Washington VI.28.1933 Wm. W. Baker, Coll. Paratypes : Electron, Washington, various dates (June&Sept., 1933, Wm. W. Baker: 5, (CASC); CNC type#4194, 4,(CNCI); 4, (OSUO); USNM type#50649, 8,(USNM); WSU type#248, 8,(WSUC).

Derivation of specific epithet .— Based on the surname of the collector of the type series of specimens, William W. Baker.

Diagnosis .— The subgeneric characters noted above, plus the following will distinguish specimens of *P. bakeri* from congeners: alternate elytral intervals elevated; elytral setae more numerous on alternate intervals, scape setose and squamose, the integument of scape completely covered, or nearly so.

Description .— Size : ♀♀ : Length 6.95-8.57 mm (mean=7.56, n=10), width across elytra 3.1-3.61 (mean=3.26, n=10). ♂♂ : Length 5.97-7.27 mm (mean=6.58, n=10), width across elytra 2.41-3.1 mm (mean=2.63, n=10); (other measurements, Table 16). Colour : dark grey-brown overall, scales cinereous with areas of beige scales on elytra; integument, where visible among scales, black or nearly so on elytra, pronotum, and frons, rufescent on antennae and distal segments of legs. Head: transverse concavity at base of frons, rostrum and frons apparently discontinuous in profile, small dark puncture medially at base of frons; thin median longitudinal carina through most of length of rostrum; faint lateral carinae barely visible through vestiture, in some specimens; nasal plate clearly distinguished from rest of rostrum, glabrous, shiny integument finely rugulose, and with v-shaped carina, not acute; vestiture of frons and rostrum of dense overlapping appressed striate scales and scattered, decumbent, flattened setae; with group of 8-10 setae supra-orbitally. Antennae: scape short, extended to anterior quarter of eye only; scape vestiture of dense, appressed scales and scattered setae, integument obscured over most of length; funiculus with long primary setae on distal portion of each annulus, and smaller, appressed secondary setae scattered over surface, integument visible. Pronotum : approximately one-fifth wider than long in females, slightly narrower, proportionately, in males; coarsely rugose-tuberculate; integument visible at apices of tubercles; median longitudinal sulcus broad, deep, the length of pronotum, deeper and broader in anterior half; vestiture of appressed, round striate scales and scattered, decumbent, flattened striate setae. Elytra : combined width approximately one-half wider than pronotum, and approximately three quarters of length of elytron, in females; in males, slightly narrower- combined width of elytra approximately two-thirds of length; declivity rounded, posterior margin vertical in lateral view, in males, reflexed in females; alternate intervals elevated, each with irregular row of decumbent, flattened setae; even intervals flat, without setae; serial pits each with round scale, larger than surrounding scales; vestiture elsewhere of dense

layer of overlapping appressed, striate scales. Legs : tibiae 1 and 2 with a few amber-coloured spines on ventral margin in apical half; corbellar area of tibia 3 indistinctly closed. Abdomen : five visible sterna in males and females; medial concavity of sternum 1 in males, convexity of sternum 1 in females, less obvious than in other species of *Panscopus* . Genitalia : ♀♀ : (Figs. 15, 41) sternum 8 much as in other species of *Panscopus* , coxites angular; bursa copulatrix long, membranous, pair of sclerites in anterior portion of bursa thin, crescent shaped; spermatheca sickle-shaped, thick in basal half, narrowed apically. ♂♂ : (Fig. 64) aedeagus slightly decurved, in lateral view, broadly rounded apically, with hint of apical acuity medially; manubrium of tegmen slightly shorter than median lobe; median struts slightly longer than median lobe; internal sac membranous, finely granulate posteriad belt of tegmen, with field of fine denticles posterior to belt of tegmen; pair of v-shaped sclerites in anterior portion (in inverted sac).

Life History Data .— Most adult specimens have been collected in the months of April, May, June and July. I have seen only four specimens which had been collected in September and three collected in October.

Geographical distribution .— Weevils of this species are known from the Puget lowlands of Washington state, and extreme southern British Columbia (Map 8).

Phylogenetic relationships .— *P. baker*i is the postulated adelphotaxon of *P. johnsoni* (Fig. 79).

Chorological affinities .— See this topic for *P. johnsoni* above (Map 8).

Material examined .— In addition to the type specimens listed above, approximately 160 specimens were examined.
CANADA:
British Columbia: Aspen Grove, 3-Jul-33?, H. Richmond, 1,(SMDV); "B.X. Mi", 2-Jun-31, Ralph Hopping, 1,(CASC); Trinity Valley, 31-May-29, J. R. Howell, 1,(CASC), 2,(CNCI); Voght Valley,?-May-1921, Ralph Hopping, 1,(CASC);
UNITED STATES OF AMERICA:
Washington: Pierce Co.: Electron, 31-May-33, J.Wilcox, 3,(CASC), 15,(OSUC); Electron, 31-May-33, S.E.Crumb, 1,(OSUC); Electron, 2-Jun-33, J.Wilcox, 1,(CASC), 1,(DEUN), 31,(OSUC); Electron, 2-Jun-33, S.E.Crumb, 1,(CASC), 36,(OSUC); Electron, 23-Jun-33, J.Wilcox, 1,(OSUC); Electron, 23-Jun-33, S.E.Crumb, 4,(OSUC); Electron, 28-Jun-33, J.Wilcox, 14,(OSUC); Electron, 24-Jul-34, S.E.Crumb, 5,(OSUC); Electron, 29-Oct-34, Wm.W.Baker, 2,(OSUC); Electron , 21-Jul-35, Van Dyke coll'n, 2,(CWOB); Electron, 15-Jul-36, Wm.W.Baker, 1,(OSUC); Electron, 21-Jul-36, Van Dyke collection, 30,(CASC); Electron, 24-Apr-37, Wm.W.Baker, 3,(OSUC);

Panscopus (Nocheles) longus Buchanan
(Map 9, Figs. 16, 42, 65)

Panscopus (Nomidus) longus Buchanan 1936:16. Blackwelder 1939:66.
Panscopus longus . Hatch 1971:291. O'Brien and Wibmer 1982:63.

Type material .— Holotype ♂: "PESHASTIN / IV-8-34 WASH; Wm.W.Baker,/Col.; Truck Crop / No 8995; TYPE USNM / 50650; Panscopus / (Nomidus) / longus Buch./ ♂ - type".

Paratypes: Peshastin, Washington, 8-Apr-34, Wm. W. Baker, Paratype USNM#50650, 1,(USNM); Peshastin, Washington, 7-May-34, P. M. Eide, Paratype #250, 1,(WSUC).

Derivation of specific epithet .— The Latin word *longus* means long. This refers to the slightly longer (in proportion to width) body of this species.

Diagnosis .— Specimens of this species are recognized by the following combination of characters: alternate elytral intervals slightly elevated, noticeable only near anterior margin of elytra, elytral setae more numerous on alternate intervals, but even intervals with a complete row of setae; setae thin, acute, and semi-erect; rostrum feebly unicarinate or non-carinate; tibia 3 slightly bent, its lower edge broadly and feebly convex in profile, and with coarse, blackish or brownish spines.

Description .— Size: Length, ♂: 8.8 mm , ♀ : 10.2 mm; Width across elytra, ♂ : 3.1 mm, ♀ : 3.8 mm; (for other measurements, see Table 17). Head: with slight depression between eyes at base of frons; frons and rostrum nearly continuous in lateral view; with thin median longitudinal carina extended length of rostrum; without clearly delineated clump of setae supra-orbitally on frons, vestiture of frons and rostrum of dense appressed scales and semi-erect , thin, pointed setae scattered more or less evenly over surface. Antennae: scape extended to middle of eye when close to rostrum; integument obscured by vestiture of flat, oblong, appressed scales and thin decumbent setae. Pronotum: wider than long; median longitudinal sulcus less obvious at middle, more obvious at posterior quarter, and anterior third; dorsal surface rugose-tuberculate, apex of tubercles black, shiny, visible through vestiture, each tubercle with seta at apex; vestiture of densely distributed, round to oval-shaped, overlapping striate scales, creamy white to light brown in colour. Elytra: elongate, rounded dorsally, in ♂ nearly parallel-sided in middle third, in dorsal view; in ♀ wider and more broadly rounded in shape, anterior margins nearly striate and sloped posteriorly toward apex of scutellum, together anterior margins in form of very shallow v; posterior declivity evenly rounded to apex in lateral view; all intervals somewhat convex, alternate ones slightly more so; each interval with row of setae, intervals 3, 5, and 7 with partly double row; setae thin, acute and semi-erect; integument obscured by vestiture of dense overlapping striate scales; scales unevenly patterned, broad areas of very light scales, and areas of light brown scales. scales of serial punctures large, obvious, approximately twice diameter of other scales on elytral surface. Legs: tibiae 1 and 2 with row of denticles and thin spines on ventro-lateral margin in distal one-half to two-thirds; tibia 3 without such spines, straight with corbellar area enclosed at apex. Abdomen: five sterna visible in females, sterna 1 and 2 convex in ♀ ; ♂ with sterna 1 and 2 with pronounced broad concavity. Genitalia: ♀♀: (Figs. 16, 42) tergum 8 broadly convex dorsally and conical apically, sternum 8 (spiculum ventrale) with apical expansion broadly spade-shaped, slightly convex ventrally and rounded at apex, cleft medially in apical portion, with fine setae apically; coxites 1 and 2 broadly angular in dorsal view, rounded apically in lateral view; stylus with two large setae at apex; bursa copulatrix with pair of curved, broadly crescent-shaped, sclerites internally, near confluence of common oviduct with bursa; spermatheca smooth, sickle-shaped,

broad at base, gradually narrowed toward apex. ♂ : (Fig. 65) aedeagus with median lobe decurved, tapering toward apex, in lateral view, in dorsal view with apex broadly rounded, median lobe wider at apical 1/3, narrowed posteriorly; interior lip with w-shaped margin, distinctly sclerotized; manubrium of tegmen approximately as long as median lobe; median struts of aedeagus approximately 1.35X length of median lobe (median struts broken from median lobe of aedeagus in holotype, apex of tegmen also broken) ; internal sac membranous with pair of small thick u-shaped sclerites, apically (anterior in inverted sac in aedeagus), membrane of internal sac without field of spicules, sparsely granulate in dorsal view.

Life History Data .— Adult specimens have been collected in April and May in Washington State.

Geographical distribution .— Specimens of this species have been collected only at Peshastin , Washington (Map 9).

Phylogenetic relationships .— *P. longus* is the postulated adelphotaxon of the ancestor of the P. *torpidus* - *P. ovalis* species pair (Fig. 79).

Material examined .— This species is known only from the type material listed above.

Panscopus (Nocheles) torpidus (LeConte)
(Map 10, Figs. 17, 43, 66)

Hylobius torpidus LeConte 1857:55. LeConte 1874:456.

Nocheles torpidus . Horn 1876:55.

Panscopus (Nomidus) pallidus Buchanan 1927:31. Schenkling and Marshall 1931:40. Buchanan 1936:15. Blackwelder 1939:66. **new synonymy**.

Panscopus pallidus . Hatch 1971:291. O'Brien and Wibmer 1982:63.

Type material .— Holotype ♀ "Type/8416; H.' torpidus/ LeC; Nocheles/torpidus/(LeC)" (MCZC) The first label is a round dark blue (faded), colour coded label to indicate that the specimen was collected in Washington or Oregon.

Additional type material of *P. pallidus* Buchanan 1927.:Holotype ♀ (USNM No. 28913) Kaslo, B.C. 23 June R. P. Currie, collector. Paratypes: Kaslo, B.C., R. P. Currie Collector , various dates, PARATYPE USNM 28913, #'s 2, 3, 6, 7, 8, 9, 12, 14, 15, 16, 17, 18, 20, 21, 22, 23, and 25, (USNM); Kaslo, B.C., R.P. Currie, collector, 23.VI, *pallidus* - 5, PARATYPE USNM 28913, CNCI paratype label # 4193,(CNCI); Big Fork, Mont., June 14&15, 1904 PARATYPE USNM 28913, #'s 26, 27, 28, 29, 30, 31, 32, (USNM); Ainsworth, B.C. 8.VI. , H.G. Dyar Collector, *pallidus* -33 PARATYPE USNM 28913 (USNM).

Notes about synonymy .— The holotype specimen of *P. torpidus* LeConte is a female specimen with five visible abdominal sterna, a relatively short antennal scape not extended to the hind margin of the eye, cinereous scales giving it a grey body colour, prothorax widest in front of middle and all elytral intervals setose. It is assignable to the species which Buchanan (1927, 1936), Schenkling and Marshall (1931), Hatch (1971), and O'Brien and Wibmer (1982) referred to as *P. pallidus* Buchanan. The 2nd, 3rd, and 4th specimens

in the same tray as the holotype, in the LeConte collection (MCZC) are a male and two females, also attributable to *P. pallidus* Buchanan. The fifth specimen in the same tray is a male specimen representing the species referred to as *P. torpidus* by Pierce (1913), Buchanan (1927,1936), and Hatch (1971), among others. It has a relatively long scape, extended to the hind margin of the eye, and has the much darker, nearly black colouration of *P. torpidus*, of recent authors. The specimens in the Horn collection, also in MCZC, shed no light on the identity of the species to which the name *P. torpidus* should apply. This is because the tray labelled *P. torpidus* includes eight specimens collectively representing four species of *Panscopus* and one species of *Lepesoma* . Two of these specimens, one female and one male, are attributable to the species referred to as *P. torpidus* by recent authors (not *P. torpidus* LeConte). The female is nearly black in colour, with only four visible abdominal sterna, a long scape extending to, or nearly to, the posterior margin of the eye. This is probably the specimen to which LeConte (1874: 453) and Horn (1876: 55) were referring in mentioning one female having one of its abdominal segments absent. LeConte's (1857: 21) description of *Hylobius torpidus* is too vague to determine which species he was studying when he applied this name; however, the word *"ater"* (black) suggests he was looking at a specimen of *P. torpidus* of recent authors. Horn's (1876, p 55) redescription of *Nocheles torpidus* (LeConte) is also inconclusive, but that his phrase "...densely covered with cinereous scales..." suggests that he was looking at material of what has recently been called *P. pallidus* Buchanan. Regardless, the identity of the holotype specimen is sufficient to establish that *P. pallidus* Buchanan is conspecific with P. *torpidus* (LeConte). This leaves the species to which Pierce (1913), Buchanan (1927, 1936), Hatch (1971) and others have erroneously applied the name *P. torpidus* (not LeConte 1857), without a name. I have, in this work, described this latter species as new, and applied the name *P. longiscapus* .

Derivation of specific epithet .— The name *torpidus* comes from the Latin *torpid* meaning numb. This probably refers to the frequent behaviour of individuals of this and other species of *Panscopus* to remain completely motionless for long periods of time.

Diagnosis .— The subgeneric characters listed above, plus the following distinguish specimens of this species from specimens of other species of *Panscopus* : the straight hind tibia, without dark coloured spines on ventral margin, all elytral intervals setose, prothorax widest in front of middle, the vestiture ashen grey in colour, and rostral carinae reduced and somewhat obscured by vestiture, in many individuals appearing unicarinate.

Description .— Size : ♀♀ : Length 6.2-7.1 mm (mean=6.7, n=10), width across elytra 2.8-3.1 mm(mean=3.0, n=10). ♂♂ : Length 5.7-6.7 mm (mean=6.2, n=10) (other measurements, Table 18). Colour : grey-brown, vestiture of scales predominantly pale grey with patches of beige scales on dorsum, varying in size among individuals; integument, where visible, rufescent. Head : transverse depression at base of frons present, frons and rostrum exhibit slight discontinuity in lateral view; rostrum with indistinct medial longitudinal carina, obscured by vestiture in some specimens; nasal plate evident, without vestiture; v-shaped carina indistinct; frons and rostrum with vestiture of dense

appressed scales and scattered, decumbent, flattened setae; loose group of setae supra-orbitally. Antennae: scape relatively short, extended to anterior margin of eye; integument obscured by vestiture of dense appressed scales and scattered decumbent setae; funiculus with vestiture of long primary setae on apical half of each annulus, and short, fine, appressed secondary setae on each annulus, integument visible. Pronotum : approximately one-fifth wider than long in females; about one-eighth wider than long in males; median longitudinal sulcus evident, broader and deeper in anterior half; surface of pronotum rugose-tuberculate; vestiture of dense scales and decumbent setae inserted upon apices of tubercles. Elytra : broadly oval in females; combined width about 75% of length, and approximately one-half longer than pronotum, in females; males proportionately narrower, combined width about 70% of length, on average, and one third wider than pronotum; declivity, in lateral view, evenly curved to apex of elytra; alternate intervals raised above level of even intervals, more so in males; alternate intervals with partly double row of setae, even intervals with incomplete row, or nearly complete row of setae, in some specimens; serial pits each with round scale, larger than surrounding scales; vestiture elsewhere of dense overlapping scales. Legs : tibiae 1 and 2 with a few pale stout spines on ventral margin, in apical half; tibia 3 nearly straight or very slightly curved; corbellar area indistinctly closed. Abdomen : five sterna visible in both sexes; sternum 1 concave at middle in males, convex at middle in females. Genitalia : ♀♀ : (Figs. 17, 43) sternum 8 with apical expansion angular, in ventral view, and approximately one-third of total length of sternum; bursa copulatrix with pair of curved sclerites, anteriorly; spermatheca robust, curved and sickle-shaped, broad and thickened, throughout. ♂♂ : (Fig 66) aedeagus with median lobe decurved; apex broadly rounded with weak suggestion of median apical acuity; manubrium of tegmen slightly longer than median lobe; median struts of aedeagus much longer than median lobe; internal sac membranous, finely granular in texture distad belt of tegmen; with round, horseshoe-shaped structure and a small v-shaped sclerite, anteriorly in inverted sac.

Life History Data .— Most of the approximately 1100 adult specimens I examined were collected in the months of May, June, and July. A few specimens were collected in the months of April and August. Three isolated specimens were collected in the month of October, including one which was sifted from moss, and one specimen was found in wood chips in March.

I have seen three larval specimens (USNM), identified as *Panscopus torpidus* , which bear labels indicating they were collected at Puyallup, Washington, 20-X-34, and that they were reared. Thus it is not certain at what stage of their development they were collected. Also, the species identification might refer to this species, *P. torpidus* (LeConte) 1857, or to the species herein described as *P. longiscapus*, which had erroneously been called *P. torpidus* by Pierce (1913) and other authors.

Host plant associations .— Plant names listed on specimen labels include *Pinus contorta, Pinus monticola, Pinus ponderosa, "Pseudotsuga taxifolia" , Populus tremuloides, Populus trichocharpa, Betula occidentalis, Acer glabrum, Salix, Vaccinium sp., "Rubus nutkana" (Ribes nutkana?), Spiraea*

discolor (= Holodiscus discolor), Cherry, *Shepherdia canadensis, Ceanothus, Symphoricarpos albus,* and *Rosa sp.*

Geographical distribution .— Weevils of this species occur in southern British Columbia, southwestern Alberta, the mountains of western Montana, northern Idaho and much of Washington State as far west as the Cascade Mountains (Map 10). Altitude records from label data vary from 610 to 1,830 metres.

Phylogenetic relationships .— *P. torpidus* is the postulated adelphotaxon of *P. ovalis* (Fig. 79).

Chorological affinities .— The geographical ranges of *P. torpidus* and *P. ovalis* overlap one another extremely (Maps 10 and 11).

Material examined .— In addition to the type material listed above, more than 1,070 specimens were examined, as follows:
CANADA:
Alberta: Calgary, 5-Jun-59, 13-Jul-57, 28-Jul-57, 6-Jun-63, 1-Jun-72, B.F. & J.L. Carr, 5, (JLCC); Coleman, 28-Jul-58, 5-Jul-81, B.F. & J.L. Carr, 2, (JLCC); Crow's Nest Pass, 9-Jun-30, 17-Jun-30, J. H. Pepper, 2, (CNCI); Ghost Dam, 7-Jul-76, B.F. & J.L. Carr, 1,(JLCC); Porcupine Hills, 18-Oct-59, B.F. & J.L. Carr, 1, (JLCC); Tp. 21 Rge. 25, W. 4 Mer., 26-May-78, B.F. & J.L. Carr, 1, (JLCC); Tp. 22 Rge. 9, W. 5 Mer., 28-May-61, B.F. & J.L. Carr, 2, (JLCC); Tp. 28 Rge.9, W. 5 Mer., 28-May-61, B.F. & J.L. Carr, 1, (JLCC); Waterton, 7-Jul-24, H.L. Seamans, 3, (CNCI); British Columbia: Aspen Grove, 13-May-34, Hugh Leech, *Populus tremuloides*, 3,(CASC), 4,(SMDV); Aspen Grove, 18-May-31, H. Richmond, *Pinus ponderosa*, 2,(CASC); Aspen Grove, 24-May-34, N. M. Downie, 1, (CWOB); Aspen Grove, 1-Jun-33, K. Graham, 2,(SMDV); "Aspen Grove, Richmond", 30-May-31, ?, 1, (SMDV); Bx. Mt., 2-Jun-31, R. Hopping, 1,(SMDV), 1,(CNCI); Baynes L., 3-Jul-81, 12-May-82, B.F. & J.L. Carr, 2,(JLCC); Boswell, 9-May-58, H. & A. Howden, 1, (CNCI); Canal Flat, 13-May-82, B.F. & J.L. Carr, 1, (JLCC); Carlin, 3-Jun-78, B.F. & J.L. Carr, 1, (JLCC); Christine L., 6.4 km E., 2-Jun-73, G.G.E. Scudder, 2,(SMDV); Cranbrook, 31-May-27, A.A.Dennys, 3,(CASC), 9,(CNCI), 1,(SMDV); Cranbrook, 13-May-82, B.F. & J.L. Carr, 2,(JLCC); Creighton Valley, 10-May-28, E. A. Rendell, 1, (CASC); Creston, 12-Jul-23, C.S. Lallamand, 1,(CASC); Creston, 27-May-49, G. Stace-Smith, "*Rubus nutkana*" (*Ribes* ?), 9,(CASC); Creston, 11-Jun-23, 4-Jun-23, C. B. Twigg, 3,(CASC); Creston, 4-Jun-23, C. B. Twigg, 4,(UAIC); Creston, 11-May-58, H. & A. Howden, *Populus trichocarpa*, 2,(CNCI); Creston, 26-May-36, G. Stace-Smith, 2,(CNCI); Creston, 23-May-84, B.F. & J.L. Carr, 6,(JLCC); Creston, 27-May-49, G. Stace-Smith, 10,(OSUO); Creston, 2-Jun-48, G. Stace-Smith, 1,(OSUO); Creston, 24-Apr-30, 5-May-32, 7-May-32, 1-Jul-32, 25-Jun-48, 27-Jun-48, 1-Oct-53,, G. Stace-Smith, 11, (SMDV); Creston, 4-May-46, G. Stace-Smith, *Spiraea discolor (=Holodiscus discolor)*, 1,(SMDV); Creston, 15-Jun-51, G. Stace-Smith, *Populus trichocarpa*, 1,(SMDV); Creston, 1-Oct-53, G. Stace-Smith, sifting moss, 2,(SMDV); Creston, 4-May-46, G. Stace-Smith, *Acer glabrum*, 1,(SMDV); Creston, 27-Jun-48, G. Stace-Smith, ex: *Rubus nutkana*, 1,(SMDV); Creston, 2 mi N., 12-Jun-62, C. W. O'Brien, 1,(CWOB); Creston, 610 m, 20-Mar-33, G. Stace-Smith, hibernating in wood chips, 1,(SMDV); Creston, Goat Mtn. Lake 1460 m, 1-Jul-33, G. Stace-Smith, ex: *Salix*, 1,(SMDV); Creston, Goat Mtn. Lake 1520 m, 2-Jul-33, G. Stace-Smith, *Vaccinium* sp.1,(SMDV);

Creston, Goat Mtn. Lake 1520 m, 6-Jun-37, G. Stace-Smith, 3,(SMDV); Creston, Goat Mtn. Summit 1520 m, 2-Jul-33, G. Stace-Smith, 1,(SMDV); Eagle River, 26-May-32, Buckel, 1,(CASC); Elko, E. Kootenay, 9-Jul-49, Hugh B. Leech, 1,(CASC); Erie, 11-Jun-84, B.F. & J.L. Carr, 1,(JLCC); Fernie, 2-Jun-35, Hugh Leech, 2,(CASC); Fernie, 20-Jun-36, Hugh Leech, 1,(CNCI); Fernie, 24-Jul-77, B.F. & J.L. Carr, 1,(JLCC); Fife, 5 mi E., 8-Jun-59, R.E. Leech, 1,(CNCI); Fort Steele, 2-May-77, B.F. & J.L. Carr, 2,(JLCC); Ft. Steele, 14-Jun-26, R. Hopping, 1,(CASC); Golden, 27-Jun-76, B.F. & J.L. Carr, 18,(JLCC); Golden, 26-Sep-76, B.F. & J.L. Carr, 1,(JLCC); Grand Forks, Jun-09, M. Miller, 2,(USNM); Gray Creek, 6-Jun-61, G. G. E. Scudder, 1,(SMDV); Howser, Selkirk Mtns., 22-Jun-05, J. C. Bradley, 2,(CUIC); Kamloops, 21-Jun-36, G.J. Spencer, 1,(SMDV); Kikomun Ck P. Pk., 27-Jun-80, R.S. Anderson, 2,(RSAN); Kimberly, 12-Jun-26, R. Hopping, 2,(CASC); Larkin, 6-Jul-34, A. Thrupp, 1,(CASC); Lorna, 30-Jun-26, H. Richmond, *Pinus contorta*, 1,(CASC); Lumby, 28-May-33, A. Thrupp, 1,(CASC), 2,(CNCI); Mara, 20-Jun, ?, 1,(CASC); Marysville, 3-Jun-58, 5-Jun-58, 29-Jun-58, F.Fodor, 5,(SMDV); Merritt, Midday Valley, 28-May-24, Auden, 1,(CNCI); Nelson, 19-May-26, R. Hopping coll'n., on Cherry, 2,(CASC); Nelson, 7-Jun-27, A.A. Dennys, 1,(CASC); New Denver, 4 mi N., 12-Aug-66, D. S. Horning, Jr., 1,(CWOB); Newgate, 2&3-Aug-56, J. Grant, 2,(SMDV); Nicola, 10-Jul-32, G.J. Spencer, 1,(SMDV); Oliver, McIntyre Rd. 910 m, 1-Jun&29-May-58, H. & A. Howden, ,2,(CNCI); Osoyoos 1070 m, 1-Jul-53, D. F. Hardwick, 1,(CNCI); Paul Lake, 24-May-33, A. Thrupp, 3,(CASC), 4,(CNCI), 3,(SMDV); Paulson, 12-Jul-62, B.F. & J.L. Carr, 1,(JLCC); Penticton, 4-Jun-58, H. & A. Howden, 1,(CNCI); Radium, 22-May-83, B.F. & J.L. Carr, 5,(JLCC); Radium, 19-May-82, B.F. & J.L. Carr, 1,(JLCC); Richmond, Aspen Grove, 30-May-31, ?, 1,(CNCI); Robson, various dates-May,Jun,Jul, 1947-1950, H. R. Foxlee, 81,(CNCI); Rock Ck., 4.8 km W., 7-Jun-59, E.E. MacDougal, 1,(CNCI); Rossland, 29-Jul-42, T. Laughton, 1,(BMNH); Salmo, 30-Jun-3-Jul-80, R. S. Anderson, open riparian, 1,(RSAN); Salmon Arm, 2-May-33, Hugh Leech, 1,(AMNH); Salmon Arm, 9-Jun-40, H. Leech, 1,(CASC); Salmon Arm, Jun-33, Hugh Leech, 2,(CNCI); Salmon Arm, 13-May-32, Hugh Leech, 3,(SMDV), 1,(UCDC), 1,(USNM); Salmon Arm, 21-Jun-29, Hugh B. Leech, 1,(UCDC); Salmon Arm, 13-May-32, Hugh B. Leech, 1, (UCDC); Salmon Arm, 13-May-32, Hugh Leech, ex: *Salix* leaves, 1,(USNM); Sanca, 26-Apr-33, G. Stace-Smith, on Cedar wall, 1,(SMDV); Sanca, 26-May-33, G. Stace-Smith, *Betula occidentalis* , 2,(SMDV); Sentinel Mtn., 1-3-Aug-1947, H.R.Foxlee, 2,(CNCI); Sicamous, 2-Jun-78, B.F. & J.L. Carr, 2,(JLCC), ,(RSAN); Silver Starr Prov. Park, 8-Aug-73, R. H. Parry, 1,(HAHC); Sinclair Canyon, Kootenay National Park, 14-Jun-62, C. W. O'Brien, *Shepherdia canadensis*, 1,(BMNH), 4,(CWOB), 1,(NMDC); Six Mile Creek, 30-May-34, A. C. Thrupp, 1,(CASC); Stagleap Creek 1555m elev., 12-Jul-81, R.J. Cannings, 1,(SMDV); Tappen, 3-Jun-78, B.F. & J.L. Carr, 5,(JLCC); Toby Creek, 17-May-84, B.F. & J.L. Carr, 1,(JLCC);Trinity Valley, 10-Jun-28, J. R. Howell, "*Pseudotsuga taxifolia* " 1,(CASC); Trinity Valley, 20-May-28, J. Howell, *Pinus monticola* , 1,(CASC); Trinity Valley, various dates, May,Jun 1928-1930, J. R. L. Howell, 2,(CASC), 4,(CNCI), 6,(SMDV); Trinity Valley, 9-May-28, W.G. Mathers, 1,(USNM); Vernon, various dates May-Jun 1924-29, Ralph Hopping, 4,(CASC), 1,(CNCI), 8,(SMDV), 3,(USNM); Vernon, 24-May-23, E. P. Venables, 1,(CNCI); Vernon, 29-May-56, R. E. Leech, 1,(SMDV); Vernon, 20-Jun-27, I.J. Ward, 1,(SMDV); Vernon, 12-May, Venables, 1,(USNM);

Wynndel, 28-May-50, G. Stace-Smith, *Pinus contorta*, 2,(CASC); Wynndel, 16-Jun-46, 7-Aug-48, G. Stace-Smith, 2,(CASC); Wynndel, 6-Jun-48, G. Stace-Smith, 1,(CNCI), 1,(SMDV); Wynndel, 8-15-May-58, H. & A. Howden, 12,(CNCI); Wynndel, Head of Lizard Creek 790 m, 4-Aug-57, G. Stace-Smith, 1,(SMDV);
UNITED STATES OF AMERICA:
Idaho: Bonner Co.: Coolin, Priest Lake, 17-23-Jul-27, E. C. Van Dyke, 51,(CASC); Elmira, 24-May-84, B.F. & J.L. Carr, 1,(JLCC); Granite, 1.6 km W, 8-Jun-71, W. F. Barr, 39,(UICM); Granite, 1.6 km W, 9-Jun-72, W. F. Barr, 27,(UICM); Laclede, Pend Oreille Riv. at night, 4-Jul-66, W. Gagne, *Shepherdia canadensis*, 2,(CWOB); Little Rona Lake St. Pk., 10-Jun-65, 1,(CWOB); Little Round Lake St. Pk., 10-Jun-63, C. W. O'Brien, 1,(CWOB); Priest Lake, ? 1897, ? 1,(FMNH); Sagle, 4-Jun-50, N. M. Downie, 1,(NMDC); Samuels, 28-May-32, C. Wakeland, 2,(USNM); Samuels, 3.2 km E., 9-Jun-72, D. E. Foster, *Ceanothus*, 18,(UICM); Samuels, Walsh, 18-Aug-68, A. R. Gittins, 2,(UICM); Sandpoint, various dates, N. M. Downie, 9,(AMNH), 11,(CNCI), 218,(CWOB), 6,(HAHC), 38,(NMDC), 1,(OSUC), 3,(PURC), 1,(RHTC), 1,(RSAN), 3,(TAMU), 3,(UCDC), 9,(USNM), Sandpoint, Jun-68, W. F. Barr, 2,(UICM); Sandpoint, 8 km E., 1-Jul-60, W. H. Lange, 1,(UCDC); Trout Creek, 19 km NE Sandpoint, 18-May-66, W. F. Barr, 2,(OSUO), 1,(UICM); Brush Lake, 1-Jun-69, L. S. Hawkins, 1,(UICM); Boundary Co.: Deep Creek State Park, 12-Jun-62, C. W. O'Brien, 1,(CWOB); Eastport, , N. M. Downie, 3,(PURC); Elmore Co., Pine, 30-May-31, H. P. Lanchester, 1,(AMNH); Kootenai Co.: Athol, 1-Jun-67, W. F. Barr, 4,(UICM); Athol, 6.4 km W., 9-Jun-71, W. F. Barr, *Ceanothus*, 3,(UICM); Beauty Creek, nr. Lk Ceour D'Alene, 4-Jun-74, W. F. Barr, 4,(UICM); Chilco, 2-Jun-59, W. F. Barr, 2,(OSUO); Farragut St. Pk., 23-May-86, W. F. Barr, sweeping, 1,(UICM); Farragut St. Pk. 1.6 km S., 23-Jun-76, M. W. Hanks, 6,(UICM); Garfield Bay, 23-Jun-68, L. S. Hawkins, Jr., 3,(UICM); Sheep Springs, 1-Jun-72, D. E. Foster, 8,(UICM); Thomson Creek, 4-Jun-74, W. F. Barr, 1,(UICM); Twin Falls, 1,(HAHC); Twin Lakes, 19-May-63, G. P. Markin, 1,(OSUO); Shoshone Co.: Clarkia, 6.4 km NW, 23-Jun-76, D. S. Hart, 2,(UICM); Valley Co.: McCall, Brundage Mtn. 1830 m, 24-Jun-38, M. C. Lane, 1,(OSUO); Snowbank Mtn., 14-Jul-76, G. A. Shook, 1,(CIDA);
Montana: Flathead Co.: Big Fork, 14-Jun-04, ?, 3,(USNM); Echo Lake, 22-May-35, R. D. Eichman, 16,(MTEC); Echo Lake, N.E. of Big Fork", 30-May-35, Eichman, 15,(MTEC); Flathead Co., ?, 24-May-36, ?, 12,(MTEC); Glacier Co.: Glacier Nat'l. Pk., Two Medicine Lake, 1-Jul-30, 1,(CASC); Lake Co.: W. of Flathead Lake, 15-Jul-55, R. C. Froeschner, 1,(MTEC); Flathead Lake, East Shore, 1-May-34, R. D. Eichman, 11,(MTEC); Flathead Lake, East Shore, 1-May-34, R. D. Eichman, on Black Raspberry, 1,(MTEC); Lincoln Co.: Libby, 3-Aug-57, R. C. Froeschner, 1,(MTEC); Noxon, 16-Jun-71, N. M. Downie, 1,(CWOB); Ravalli Co., , 19-May-36, 1,(MTEC); Sanders Co.: Thomson Falls, 10-23.Aug.1950, B. Malkin, 2,(FMNH); unknown co.: "Koo-Koo Sint.Ridge, Cabinet N. F. 1070-1220 m, 5-Jul-50, B. Malkin, 1,(FMNH);
Washington: Chelan Co.: Leavenworth, 13 km SW: 8 Mile Cpgd., 28-Jun-87, T. G. Spanton, series ex;*Symphoricarpos albus* primarily, also *Rosa, Holodiscus discolor,* and *Rubus* sp.,at night, 38,(TGSC); Peshastin, 19-May-35, W. W. Baker, 1,(DEUN), 1, OSUO); Molson, 3.2 km NE, 14-25 June 1919, A. C. Burrill, 1,(USNM); Spokane Co.: Mt. Spokane 1520-1770 m, 22-Jun-35, K. E. Gibson, ,1,(UICM); Mt. Spokane St. Pk. 1790 m, 12-Jul-71, N.M. Downie, 1,(RSAN);

Stevens Co.: Bossburg, 11-Jun-84, B.F. & J.L. Carr, 1,(JLCC); Lost Lake, 18-Jun-54, B.Malkin&D. Boddy, 1,(FMNH); Yakima Co.:
Rainier National Park, Sawmill Flat, 25-May-35, ?, 1,(OSUO); Rainier Natl. For., Indian Flat Camp, 5-Jul-33, S. E. Crumb, 1,(DEUN), 1,(OSUO); Rainier Natl. For., Indian Flat Camp, 27-Jun-39, S. E. Crumb, 2,(OSUO); Rainier Natl. For. Sawmilll Flat, 15-Jun-35, J. Wilcox, 4,(UCDC); Sawmill Flat Forest Camp, 6-Jul-35, J. Wilcox, 14,(CASC); Sawmill Flat, Rainier Nat. for., 25-May-35, J. Wilcox, 54,(OSUO); Sawmill Flat, Rainier Nat. for., 1-Jun-35, J. Wilcox, 12,(OSUO); Sawmill Flat, Rainier Nat. for., 5-Jul-33, S. E. Crumb, 2,(OSUO); Sawmill Flat, Rainier Nat. for., 30-May-36, 6-Jun-37, W. W. Baker, 3,(OSUO);
Tieton, 13-May-31, A. R. Rolfs, 1,(OSUO);

Panscopus (Nocheles) ovalis Pierce
(Map 11, Figs. 18, 44, 67)

Panscopus (Nomidus) ovalis Pierce 1913:396. Buchanan 1927:30. Schenkling and Marshall 1931:41. Buchanan 1936:15. Blackwelder 1939:66.
Panscopus ovalis . Hatch 1971:292. O'Brien and Wibmer 1982:63.

Type material .— Holotype ♀ (USNM No. 14643) Banff Springs, Alberta 10 June Coll Hubbard & Schwarz.

Derivation of specific epithet .— The Latin word *ovalis* means egg-shaped. Females of this species are slightly broader and more ovoid in body shape, than most species in the genus.

Diagnosis .— The straight tibia 3, alternate elytral intervals elevated, with an irregular double,or partly triple row of blunt setae, and even elytral intervals flat without setae, distinguish *P. ovalis* from all other species of *Panscopus* except *P. bakeri* . Buchanan's key character to separate *P. ovalis* from *P. bakeri* , the proportion of width/length of the 7th funicular segment, does not hold, even for the type specimens. Funicular segment 7 of *P. ovalis* is slightly wider than long, by a ratio of ~6/4 or 7/5, but is not twice as wide as long, in any specimens, as Buchanan (1936) indicated. The width/length ratio of funicular segment 7 of *P. bakeri* measures 1/1 in most specimens. In addition, specimens of *P. ovalis* possess a coarsely tricarinate rostrum, in *P. bakeri* the rostrum is unicarinate, with the lateral carinae not, or very slightly evident.

Description .— Size : ♀♀ : Length 6.5-7.5 mm (mean=7.0, n=8), width across elytra 2.9-3.4 mm (mean=3.1, n=8). ♂♂ : Length 6.1-6.8 mm (mean=6.4, n=5), width across elytra 2.3-2.7 mm (mean=2.5, n=5) (other measurements, Table 19). Colour : grey-brown; under magnification, vestiture of predominantly beige to light brown scales, and areas of lighter, pale grey scales near margins of elytra and lateral portions of pronotum; integument, where visible among scales of dorsum, black, on distal portions of legs, antennae, etc., integument rufescent. Head : transverse shallow depression at base of frons evident, frons and dorsal surface of rostrum discontinuous, in lateral view; distinct median longitudinal carina clearly visible through scales, distinct lateral longitudinal carinae on dorsum of rostrum; vestiture of frons and rostrum dense scales and scattered setae, with supra-orbital group of 8-10 setae; nasal plate evident, glabrous; nasal carina V-shaped. Antennae: scape

short, extended to anterior margin of eye; integument obscured by vestiture of scales and setae; funiculus with long and short setae, integument visible, annulus 7 approximately one-third wider than long. Pronotum : approximately one-quarter wider than long in females, proportionately narrower in males; median longitudinal sulcus evident; surface rugose tuberculate; vestiture of dense grey to beige scales and scattered setae, inserted in apices of tubercles. Elytra : broadly oval, combined width 75% of length, 50% wider than prothorax, in females; combined width approximately 70% of length and one-third wider than pronotum, in males; alternate intervals elevated, more so in males, with double to partly triple row of setae; even intervals flat, without setae or with few setae near anterior margin, or near declivity; serial pits each with round scale larger than surrounding scales. Legs: tibiae 1 and 2 with few amber-coloured spines on ventral margin, in apical half; tibia 3 nearly straight, without such spines; corbellar area of tibia 3 narrowly and indistinctly closed. Abdomen : five sterna visible in both sexes; sternum 1 shallowly concave at middle in males; sternum 1 slightly convex at middle in females. Genitalia : ♀♀ :(Figs. 18, 44) sternum 8 with apical expansion approximately one-third total length; bursa copulatrix membranous; pair of crescent-shaped sclerites anteriorly in bursa, near confluence of common oviduct; spermatheca thick and robust. ♂♂ : (Fig. 67) median lobe of aedeagus gently decurved; apex of median lobe with angular acuity apically; manubrium of tegmen, median struts, and median lobe all of approximately equal length; with a crudely horseshoe-shaped sclerite with angular apex posteriorly and small broadly v-shaped piece anteriorly in inverted sac.

Life History Data .— Adult specimens of this species have been collected in the months from May through August.

Host plant associations .— In the area around Edmonton, Alberta, specimens have been found on the foliage of *Alnus tenuifolia*, *Cornus stolonifera* , *Ribes* sp., *Salix* , and *Vaccinium* .

Geographical distribution .— Weevils of this species are known to occur in northern Idaho, southwestern British Columbia, and western and central Alberta, as far north as Fawcett. There is also a single specimen (CNCI), bearing a label of P.A.N.P., Saskatchewan which probably indicates Prince Albert National Park (Map 11).

Phylogenetic relationships .— *P. ovalis* is the postulated adelphotaxon of *P. torpidus* (Fig. 79).

Chorological affinities .— See this topic for *P. torpidus* , above (Maps 10 and 11).

Material examined .— In addition to the type material mentioned above, approximately 35 specimens were examined, as follows:
CANADA:
Alberta: Edmonton, Whitemud Creek, 4-Jun-89, T. G. Spanton, night, 2,(TGSC); Edmonton, Whitemud Creek, 4-Jun-89, T. G. Spanton, *Ribes*, 1,(TGSC); Edmonton, Whitemud Creek, 4-Jun-89, T. G. Spanton, *Cornus stolonifera*, 1,(TGSC); Edmonton, Whitemud Creek, 4-Jun-89, T. G. Spanton, *Alnus tenuifolia*, 2,(TGSC); Edmonton, Whitemud Creek, 10-Jul-89, T. G. Spanton, *Salix*, 1,(TGSC); Edmonton: North Sask. River Valley, 26-Jun-89, T. G. Spanton,

Cornus stolonifera, 1,(TGSC); Edmonton: North Sask. River Valley, 25-Jun-89, T. G. Spanton, *Alnus tenuifolia*, 1,(TGSC); Edmonton: North Sask. River Valley, 25-Jun-89, T. G. Spanton, *Cornus stolonifera*, 2,(TGSC); Edmonton: North Sask. River Valley, 30-Jun-89, T. G. Spanton, *Amelanchier alnifolia* , 1,(TGSC); Fawcett, 20-Jun-32, E. H. Strickland, 2,(UASM); Laggan, 4-Nov-1892, Bean Collection, 1,(AMNH); Olds, ?, T. N. Willing, 1,(SMDV); British Columbia: Creston, 13-Jun-52, G. Stace-Smith, 2 (SMDV); E. Palliser River basin, 21-Aug-1986, D. Langor & G. Pohl, 1 (TGSC); Fort Steel, 23-May-77, B.F. & J.L. Carr, 1 (JLCC); Nixon Creek, Kootenay Natl. Park, 28-Jul-42, G. R. Hopping, 1 (CNCI); Saskatchewan: P.A.N.P (Prince Albert Nat'l.Park), 9-Jun-45, F.I.S. W-356, Willow, 1 (CNCI);
UNITED STATES OF AMERICA:
Idaho: Idaho Co.: Deep Saddle, Lolo Trail, 24-Aug-52, H. C. Mania, 5 (USNM); Latah Co.: Laird Park, 20-May-51, R. B. Spurrier, 2 (WSUC); Laird Park, 20-May-51, M. T. James, 3 (WSUC); Laird Park, 14-May-62, W. F. Barr, 2 (UICM); Moscow, 20-May-51, L. R. Campbell, 1 (WSUC).

Panscopus (Nocheles) tricarinatus Buchanan
(Map 12, Figs. 19, 45, 68)

Panscopus (Nomidus) tricarinatus Buchanan 1927:32. Schenkling and Marshall 1931:41. Buchanan 1936:15. Blackwelder 1939:66.

Panscopus tricarinatus . Hatch 1971:291. O'Brien and Wibmer 1982:63.

Type material .— Holotype ♂ (USNM No. 28912) Hood River Rapids, Parkdale, Oregon July 30, 1921 M. C. Lane, Coll.

Derivation of specific epithet .— The specific epithet is from the Latin *tri* , meaning three, and *carina* , meaning keel or ridge. This is in reference to the three parallel longitudinal ridges evident on the dorsal surface of the rostrum.

Diagnosis .— Specimens of this species are distinguished by their tricarinate rostrum, hind tibia nearly straight, its lower edge without stout spines in most individuals (in some specimens, a few spines are visible), all elytral intervals are setose and the prothorax is widest at about the middle.

Description .— Size : ♀♀ : 5.5-6.5 mm (mean=6.1, n=10), width across elytra 2.4-2.8 mm (mean=2.6, n=10). ♂♂ : length 5.3-6.3mm (mean=5.8, n=10), width across elytra 2.1-2.4mm (mean=2.3, n=10); (other measurements, Table 20). Colour : brown. Head : transverse impression at base of frons slight, head and rostrum apparently nearly continuous, in lateral view; three coarse, longitudinal carinae in the integument of dorsum of rostrum; carinae mostly obscured by vestiture of decumbent to semi-erect scales, in some specimens; loose group of six to eight semi-erect, flattened setae supra-orbitally; nasal plate distinct, without vestiture of rest of rostrum; nasal carina indistinct, u-shaped. Antennae: scape relatively short, extended to anterior margin of eye; integument obscured by vestiture of dense scales and scattered decumbent setae, over most of its length; proximal annuli of funicle with few thin short setae, many decumbent stout long primary setae; distal annuli with fewer primary setae, more fine, short, appressed, secondary setae; funicular annulus 7 approximately as wide as long. Pronotum : one-sixth wider than long in females; slightly less wide, in proportion to length, in males; median longitudinal

sulcus, deeper at anterior third; surface rugulose; vestiture of dense, overlapping, striate scales, and scattered, decumbent setae. Elytra : broadly oval, combined width, on average 72% of length, and nearly one-half wider than pronotum, in females; slightly narrower in males, combined width ~ 65% of length, on average; alternate intervals raised more than even intervals, more pronounced in males; alternate intervals with double to partly triple rows of setae; even intervals with single row of decumbent, flattened setae; serial punctures each with nearly round scale, significantly larger than surrounding scales; elsewhere vestiture of dense layer of overlapping striate scales; Legs : tibiae 1 and 2 with several amber-coloured stout spines on ventral margin, in apical half; tibia 3 without such spines in most specimens; corbel of tibia 3 narrowly and indistinctly closed, with very small appressed scales inserted near corbellar area; Abdomen : five sterna visible in both sexes; median concavity in sternum 1 and anterior portion of sternum 2, in males; females with slight convexity in sternum 1 and 2; medial concavity in form of shallow longitudinal sulcus in apical portion of sternum 5, in males; sternum 5 without such concavity in females. Genitalia : ♀♀: (Figs. 19, 45) sternum 8 with apical expansion one third of its length; pair of sclerites in bursa copulatrix near confluence with common oviduct, linear in shape, not crescent-shaped as in other species of this subgenus; spermatheca sickle-shaped, medium in width throughout. ♂♂ : (Fig. 68) median lobe of aedeagus slightly decurved; apex broadly rounded with suggestion of apical acuity medially, in postero-dorsal view; manubrium of tegmen as long as median lobe; median struts slightly longer than median lobe; internal sac membranous, with finely granular texture posteriad belt of tegmen; with single small v-shaped sclerite, internally near apex of sac (anterior end of inverted sac).

Life History Data .— All of the approximately 250 specimens of *P. tricarinatus* examined, were collected in the months of June or July.

Host plant associations .— The only plant species association I have seen is a series of three specimens collected near Mt. Hood, Oregon, which bear labels indicating they were found on lupine.

Geographical distribution .— I have seen specimens of this species from only the vicinity of Mt. Hood, Oregon; and Mt. Adams, Washington, where they are known to occur at altitudes between 910 and 1,830 metres (Map 12).

Phylogenetic relationships .— *P. tricarinatus* is the postulated adelphotaxon of the ancestor the clade which includes the species *P. bufo, P. abruptus, P. rugicollis, P. aequalis,* and *P. squamifrons* (Fig. 79).

Chorological affinities .— The range of *P. tricarinatus* is overlapped with the ranges of *P. aequalis, P. abruptus.*, and *P. rugicollis* (Maps 12, 15, 17, and 18).

Material examined .— In addition to the type material listed above, approximately 250 specimens were examined:
UNITED STATES OF AMERICA:
Oregon:
USA, OR, Hood River Co.: Hood River, ?-Jul-31, R. H. Beamer, 1,(RSAN); Parkdale, 5-Jun-72, R. G. Rosensteil, 1,(CWOB); Parkdale. Hood River Rapids, 30-Jul-21, M.C. Lane, 2,(CASC), 1,(USNM); Mt. Hood 910-1830 m, 20-Jun-25,

?, 1,(UCDC); Mt. Hood 910-1830 m, 21-26-Jun-25, E. C. Van Dyke, 8,(CASC); Mt. Hood 1520-1830 m, 1-Jul-27, E. C. Van Dyke, 70,(CASC); Mt. Hood Cloud Cap Inn, 26-Jul-61, D. R. Smith, lupine, 3,(OSUO); Mt. Hood Cloud Cap Road, 17-18-Jul-33, J. Wilcox, 1,(AMNH), 5,(CASC), 29,(OSUO); Mt. Hood Cloud Cap Road, 21-Jun-35, J. Wilcox, 21-Jun-35, 44,(OSUO); Mt. Hood Cloud Cap Road, 17&18-Jul-33, S. E. Crumb, Jr., 16,(OSUO): Mt. Hood Cloud Cap Road, 22-Jun-35, S. E. Crumb, Jr., 2,(OSUO); Mt. Hood, Cloud Cap Road 1370 m, 17-Jul-33, J. Wilcox, 2,(USNM), 1,(DEUN); Mt. Hood, Homestead Inn, 15-Jul-33, K. E. Gibson, 2,(UICM);Mt. Hood. Homestead Inn, 30-Jun-27, E. C. Van Dyke, 1,(CASC); Mt. Hood. Homestead Inn, 1-Jul-27, E. C. Van Dyke, 20,(CASC); Mt. Hood. Homestead Inn, 3&5-Jul-27, E. C. Van Dyke, 2,(CASC); Washington: Yakima Co.: Mt. Adams, elev.1220 m, 21-Jun-35, S. E. Crumb, 4,(UCDC);

Panscopus (Nocheles) bufo Buchanan
(Map 13, Figs. 20, 46, 69)

Panscopus (Nomidus) bufo Buchanan 1927:31. Schenkling and Marshall 1931:41. Buchanan 1936:15. Blackwelder 1939:66.

Panscopus bufo . O'Brien and Wibmer 1982:63.

Type material .— Holotype ♀ (USNM No. 28916) Round Valley, Inyo Co., California 10,000 ft. ex stomach *Bufo halophilus* U.S. Biol. Survey No. 711.

Derivation of specific epithet .— *Bufo* is both the Latin word for toad and the scientific name of a genus of toads. The holotype specimen of *P. bufo* was collected from the stomach of a toad of the species *Bufo halophilus* .

Diagnosis .— Weevils of this species are recognized by having the hind tibia curved ventrally, with dark coloured spines on the lower edge in apical third, elytral intervals subequally convex, the alternate intervals only slightly elevated near base of elytra, the even intervals with row of setae their entire length, and elytral setae are flat, blunt, and decumbent.

Description .— Size : ♀♀ : Length 5.7-7.0 mm (mean=6.2, n=12), width across elytra 2.5-3.0 mm (mean=2.8, n=12); ♂♂ : Length 6.1-6.8 mm (mean=6.5, n=7), width across elytra 2.1-2.5 mm (mean=2.4, n=7); (other measurements, Table 21). Colour : grey-brown, with irregular patches of lighter, cream-coloured scales on elytra, and laterally on pronotum. Head : transverse impression at base of frons slight, rostrum and frons nearly continuous in lateral view; rostrum unicarinate, median longitudinal sulcus hardly visible among scales; nasal plate indistinct, nasal carina evident, U-shaped; vestiture of rostrum and frons of dense, overlapping scales and scattered, broad, scale-like decumbent setae, group of seven or eight setae present supra-orbitally. Antennae: scape relatively short, extended only to anterior margin of eye; vestiture of densely distributed overlapping scales and scattered setae; integument obscured over most of its length; funicular annuli with primary setae and dense vestiture of appressed small, fine setae; integument visible among setae. Pronotum : approximately one-sixth wider than long in females, slightly narrower in proportion to length in males; median longitudinal sulcus in females, thin and deeper anteriorly; sulcus reduced or nearly absent in males; dorsal surface finely rugose-tuberculate; vestiture of dense scales and scattered setae. Elytra : combined width approximately 50% wider than pronotum,

approximately 78% of length, in females; combined width approximately 40% wider than pronotum, 68% of length of elytra, apparently narrower and more parallel-sided in males; intervals subequally convex, alternates slightly elevated near base, and along sutural interval, in females; alternate intervals slightly elevated in males; all intervals with decumbent, flattened setae along their length; serial punctures each with round to oval scale, larger than surrounding scales; elsewhere, vestiture of dense overlapping scales. Legs : tibiae 1 and 2 each with stout spines on ventral margin in apical half; tibia 3 distinctly curved, corbellar area closed. Abdomen : sternum 1 concave at middle in males, slightly convex in females. Genitalia : ♀♀ : (Figs. 20, 46) sternum 8 with apical expansion rounded at apex, approximately one-third length of sternum; bursa copulatrix membranous, pair of curved sclerites anteriorly, near confluence of common oviduct.; spermatheca small, thickened. ♂ ♂ : (Fig. 69) aedeagus slightly decurved, in lateral view; angular medially, at apex in dorsal or ventral views; manubrium of tegmen approximately one-quarter longer than median lobe; median struts approximately one-half longer than median lobe; internal sac membranous, with broadly rounded, horseshoe-shaped sclerite, and small v-shaped sclerite, both located anteriorly in inverted sac.

Life History Data .— Most of the approximately 200 specimens I have examined were collected in the months of June or July. One specimen was collected in late May, and one in late August.

Host plant associations .— I collected 121 specimens of this species near Sonora Pass, Mono Co. California from *Symphoricarpos* sp., possibly *vaccinioides*, and on *Artemisia* sp. These were two of only three species of understory shrub present in the single species pine (*Pinus contorta*) forest. I did not find specimens of *P. bufo* on the third type of shrub, a *Ribes* sp. At other localities I have collected one specimen from each of *Ribes nevadense,* and *Prunus emarginata* . I have seen one other plant record, from the label of a borrowed specimen, *Castanopsis* .

Geographical distribution .— Weevils of this species are known to occur in the Sierra Nevada Mtns. of east central California,as well as in localities in Shasta and Siskiyou counties in northern California (Map 13). In the Sierra Nevada they are known from altitudes of 2,140 to 2,650 metres.

Phylogenetic relationships .— *P. bufo* is postulated as one element in a trichotomy including the ancestor of the *P. schwarzi –P. coloradensis* clade and the clade which includes *P. aequalis, P. squamifrons* ,*P. abruptus,* and *P. rugicollis* (Fig. 79).

Chorological affinities .— The range of this species is overlapped by the ranges of the species of the *P. aequalis* complex (Maps 13, and 15-18).

Material examined .— In addition to the type material indicated above, approximately 200 specimens were examined, as follows:
UNITED STATES OF AMERICA:
California: Eldorado Co.: ?, ?, Van Dyke collection, 1,(CASC); Fresno Co.: Huntington Lake, 23,25&31-Jul-40, A. T. McClay, 3,(UCDC); Huntington Lake 2140 m, 7&18-Jul-19??, E.P.Van Duzee, 2,(CASC); Kaiser Pass, 20-Jul-37, ?, 1,(USNM); Madera Co.: Cold Spring Meadow, 24 km NE The Pines. 2190 m, 27-Jul-34, F.E.Blaisdell, 1,(CASC); Mariposa Co.,3-Jun-14, F. W.

Nunenmacher, ,14,(FMNH); Mariposa Co.: Aspen Valley, Yosemite, Jun-15, H. G. C. Champion, 3,(BMNH); Glacier Pt. 2200 m, 13-Jun-31, 1,(CWOB), 2,(UCDC); Yosemite Valley, 5-Jun-21, 25-Jun-21, 7-Jul-21, 8-Jul-21, Van Dyke collection, 10,(CASC); Mono Co., Sonora Pass, 5 km E of Summit 2650 m, 16-25.June.1986, T.Spanton&B.Brown, F.I.T. lodgepole pine forest, 24,(TGSC); Sonora Pass, 5 km E of Summit 2650 m, 23&24-June-1986, T. G. Spanton, ex.: *Symphoricarpos* sp., probably *vaccinioides* , night, 5°C , 69,(TGSC); Sonora Pass, 5 km E of Summit 2650 m, 23&24-June-1986, T. G. Spanton, ex.: *Artemisia* sp., 54,(TGSC); White Mtns. 10,000ft., 23-Jun-61, D. R. Miller, 1,(UCDC); Nevada Co.: Cisco, 13-Jun-39, M.A.Cazier, G.E.Bohart, 106,(AMNH); Nevada City, 27-May-41, A. T. McClay, 1,(UCDC); Plumas Co., Chester, 13-Jun-63, D.J. & J.N. Knull, 2,(OSUC); Shasta Co.: Lassen N. P., Manzanita Lake, 4.8 km NE, 8-Jun-41, C.D. &M. H. Michener, *Castanopsis*, 1,(RSAN); Siskiyou Co.: Mt. Shasta, 1-Jul-40,30-Jun-41,30-Jun-40, A. T. McClay, 3,(UCDC); Sierra Co.: Sierra City, 16-Jun-40, M.Cazier & T. Aitken, 4,(AMNH); Tuolumne Co.: Cascade Creek, 32 km E&10km N Strawberry, 25-Jun-86, T. G. Spanton, *Ribes nevadense*, 1,(TGSC); Cascade Creek, 32 km E&10km N Strawberry, 25-Jun-86, T. G. Spanton, *Prunus emarginata*, 1,(TGSC); Lyons Dam?, 5-Jun-32, E. C. Zimmerman, *Ceanothus*, 1,(USNM); Tuolumne Co., Sonora Pass, 5.6 km W of Summit, 16-22-Jun-1986, T. G. Spanton, F.I.T., Aspen Grove, 1,(TGSC); Strawberry, 20-Jun-51, A. T. McClay, 1,(UCDC); 8 mi NE Twain Hart, 15-26-Jun-1986, T.G. Spanton&B.V.Brown, F.I.T., 3,(TGSC); unknown counties: Lake Tahoe, 20-Aug-36, B. E. White, 1,(USNM).

Panscopus (Nocheles) schwarzi Buchanan
(Map 14, Figs. 21, 47, 70)

Panscopus (Nomidus) schwarzi Buchanan 1927-30. Schenkling and Marshall 1931:41. Buchanan 1936:15. Blackwelder 1939:66

Panscopus schwarzi . Hatch 1971:291. O'Brien and Wibmer 1982:63.

Type material .— Holotype ♀ (USNM No. 28914) Alta, Ut. June 29 [no year indicated] Coll. Hubbard & Schwarz.

Derivation of specific epithet .— This name is based on the surname of Eugene Amandus Schwarz, who along with Henry Guernsey Hubbard, collected the type specimen of this species, and much material of many other weevil species in western North America in the early part of this century.

Diagnosis .— The subgeneric characters noted above, plus the following characters distinguish specimens of *P. schwarzi* and *P. coloradensis* from other species of *Panscopus* : alternate elytral intervals elevated, even intervals flat and without, or nearly without, setae; rostrum with indistinct carina or non-carinate; tibia 3 slightly bent, its lower edge broadly convex and with some coarse brownish spines on ventral margin in apical third; prementum without median carina. Specimens of *P. schwarzi* are distinguished from those of *P. coloradensis* by the clump of six to ten flattened, scale-like, usually light buff-coloured supra-orbital setae present on the former.

Description .— Size : ♀♀ : Length 5.78-7.53 mm (mean=6.71, n=10), width across elytra 2.59-3.1 mm (mean=2.79, n=10); ♂♂ : Length 5.84-6.75

mm (mean=6.36, n=10), width across elytra 2.22-2.66 mm (mean=2.38, n=10); (other measurements, Table 22). Colour : brown. Head : transverse depression at base of frons slight, rostrum and frons nearly continuous in lateral view; thin, shiny median longitudinal carina present on rostrum in some specimens, obscured by vestiture in some; lateral rostral carinae not evident, or hardly evident through vestiture, in some specimens; nasal plate evident, without dense vestiture; vestiture of rostrum and frons of dense scales; supra-orbital group of stout setae present; antennal scape short, extended to only anterior margin of eye. Antennae: scape with vestiture of dense scales and setae, integument obscured; funiculus with long setae near apex of each annulus, appressed small fine setae elsewhere, integument visible. Pronotum : approximately one-fifth wider than long in females, slightly narrower in males; median longitudinal sulcus smoothly rounded, not sharply delimited at margins; surface of pronotum irregular, vestiture of dense scales and scattered setae, integument not visible. Elytra: broadly oval, combined width approximately 70% of length in females; slightly narrower, on average in males; declivity evenly rounded to apex, in lateral view, in males; posterior margin slightly reflexed, in females; alternate intervals slightly raised over even intervals, alternate intervals with double and partly triple rows of setae; even intervals without setae, or nearly so; serial pits each with round scale, larger than surrounding scales; vestiture elsewhere of dense overlapping scales. Legs: tibiae 1, 2, and 3 with stiff, amber-coloured to brown spines on ventral margin in apical half; tibia 3 curved ventrally in profile; corbellar area narrowly and indistinctly closed. Abdomen : five sterna visible in both sexes, sternum 1 concave at middle in males, convex in females. Genitalia : ♀♀ :(Figs. 21, 47) sternum 8 with apical expansion about one quarter of total length; bursa copulatrix short, about as long as coxites; pair of crescent-shaped sclerites anteriorly near confluence of common oviduct. ♂♂ : (Fig. 70) aedeagus decurved, in lateral view; apex of median lobe with angular apical acuity medially; manubrium of tegmen about as long as median lobe;; median struts one-half longer than median lobe; internal sac with large, round, horseshoe-shaped sclerite, and smaller, v-shaped sclerite.

Life History Data .— Adult specimens I have seen have been collected in the months of May, June, July, and August.

Host plant associations .— I have seen three series of specimens, each including more than ten individuals, all from localities in Utah Co., Utah, which bear the plant names, *Physocarpus malvaceus* , *Polemonium albiflavum* , *Symphoricarpos oreophilus* .

Geographical distribution .— Specimens of this species are known from the Wasatch Mtns. of northern Utah, and from isolated localities in Idaho and western Montana (Map 14). Altitude records from label data of specimens collected in Montana range from 1,220 to 1,520 metres. Altitude records from the Wasatch Mountains of Utah vary from 2,130 to 2,600 metres.

Phylogenetic relationships .— *P. schwarzi* is the postulated adelphotaxon of *P. coloradensis* (Fig. 79).

Chorological affinities .— The ranges of this species and *P. coloradensis* are adjacent to one another, but not overlapping.

Material examined .— In addition to the holotype, approximately 120 specimens were examined:
UNITED STATES OF AMERICA:
Idaho : Idaho Co.: Lolo Trail, BitterRoot Mtns., Jul-1902,C. V. Piper, 1,(USNM); Shoshone Co.: Wallace, 9-Jul-16, Otto Huellman Coll'n, 1,(UICM); Wallace, 17-Jun-17, Otto Huellman Coll'n, 1,(UICM); Valley Co.: McCall, 10-Jun-33, F. H. Shirck, 1,(OSUO); Montana: Mineral Co.: Saltese, 11.2 km W., 23-Jun-57, H. S. Dybas, 3,(FMNH); Clark's Peak, Cabinet Natl.For. 1220-1520 m., B. Malkin, 3,(FMNH); Utah: Cache Co.: Logan Canyon, 17-May-51, N. T. Packer, 1,(UCDC); Summit Co., Cobble Creek 24 km E Kamas 2600m, 2-Jul-87,T. G. Spanton, 2,(TGSC); Utah Co., Aspen Grove, 9-Jul-69, Wayne E. Clark, 12,(WECC); Aspen Grove. Mt. Timpanogos, 5&7-Jul-35, Van Dyke coll'n, 10,(CASC); Glacier Lake, Timpanogas,?, Vasco Tanner, 3,(USNM); Hwy 80, 24-Aug-66, L. & C. O'Brien, 1,(NMDC), 6,(CWOB); Hwy 80 summit, 1.6 km E., 24-Aug-66, L. & C. W. O'Brien, 3,(CWOB); Mt. Timpanogos, 23-Jun-50, G.Bohart&G.Knowlton, 2,(UCDC); Provo Canyon, 3-Jul-68, Wayne E. Clark, 11,(WECC); Timp Haven, 4-Jul-67, Don R. Harris, 3,(TAMU); Timpooneke Cpgd, 18km E Alpine, hwy 92, 21-Jul-87,T. G. Spanton,*Symphoricarpos oreophilus* , 11,(TGSC); Wasatch Mtns. Aspen Grove Cpgd. 2130 m,25-Jun-62, C. W. O'Brien, *Physocarpus malvaceus* , 5,(CWOB), 1,(PURC), 2,(OSUC); Wasatch Mtns. Big Tree Cpgd. 2410 m, 25-Jun-62,C. W. O'Brien, *Polemonium albiflavum* , 1,(AMNH), 1,(BMNH), 20,(CWOB), 1,(KSUC), 2,(RSAN); Upper Rock Cyn, 4-Jul-68, Wayne E. Clark, 6,(WECC);

Panscopus (Nocheles) coloradensis Van Dyke
(Map 14, Figs. 22, 48, 71)

Panscopus coloradensis Van Dyke 1936:80. Blackwelder 1939:66. O'Brien and Wibmer 1982:63.

Type material .— Holotype ♀ "Cumbres/ Pass, Col. 10,000 ft./ VI-12-35 ; Van Dyke/ Collection " and 12 specimens, same label data, labelled as Paratypes (CASC).

Notes about synonymy .— Van Dyke (1936) did not mention subgeneric categories, and O'Brien and Wibmer (1982) did not recognize any subgenera in *Panscopus* . Blackwelder (1939) did not to place *P. coloradensis* in any subgenus of *Panscopus* , though he followed Buchanan's (1936) scheme of classifying the other species into subgenera.

Derivation of specific epithet .— Based on the name of the state containing the type locality of this species.

Diagnosis .— The subgeneric characters noted above, plus the following characters distinguish specimens of *P coloradensis* and *P. schwarzi* from other species of *Panscopus* : alternate elytral intervals elevated, even intervals flat and without, or nearly without, setae; rostrum with single indistinct carina or non-carinate; tibia 3 slightly bent, its lower edge broadly convex and with some coarse brownish spines on ventral margin, in apical third; prementum without median carina. *P. coloradensis* differs from *P. schwarzi* in lacking a distinctly delineated clump of supra-orbital setae: setae are arranged diffusely over frons

and rostrum, are less flattened, and in most specimens of *coloradensis* are brown in colour.

Description .— Size : ♀♀ : Length 6.36-7.4 mm (mean=6.8, n=10), width across elytra 2.53-3.1 mm (mean=2.84, n=10). ♂ : Length 6.4 mm (n=1), width across elytra 2.34 mm (n=1); (other measurements, Table 23). Colour : brown. Head : transverse depression at base of frons subtle, frons and rostrum apparently continuous in lateral view; rostrum apparently non-carinate, longitudinal carinae if present, thin, low and completely obscured by vestiture in most specimens; nasal plate distinct, without vestiture, v-shaped carina present; vestiture of rostrum and frons of dense overlapping scales and scattered decumbent setae; supra-orbital setae scattered, not in dense clump. Antennae: scape short, extending to only front of eye; vestiture of dense scales and scattered, decumbent setae, the integument obscured; funiculus with long primary setae and scattered appressed, fine, short, secondary setae on each annulus, shiny integument visible among setae. Pronotum: one-third wider than long, broadly convexly rounded on lateral margins, widest at middle; median longitudinal sulcus nearly absent, evident as faint depression, or longitudinal interuption of distribution of scattered setae on dorsum; dorsum finely irregular, granulate, not coarsely rugose or tuberculate; vestiture of dense, appressed, striate scales, and scattered, decumbent, flattened setae. Elytra : broadly oval, combined width approximately 70% of length in females; slightly narrower, on average in males; declivity evenly rounded to apex, in lateral view, in males; posterior margin slightly reflexed, in females; alternate intervals slightly raised over even intervals, alternate intervals with double and partly triple rows of setae; even intervals without setae, or nearly so; serial pits each with round scale, larger than surrounding scales; vestiture elsewhere of dense overlapping scales. Legs :tibiae 1 and 2 with stiff amber-coloured spines on ventral margin in apical half; tibia 3 without such spines evident, curved ventrally in profile, corbellar area narrowly closed. Abdomen : five visible sterna in both sexes; sternum 1 convex at middle in females, concave at middle in males. Genitalia : ♀♀ :(Figs. 22, 48) sternum 8 with apical expansion about one quarter of total length; bursa copulatrix short, about as long as coxites; pair of crescent-shaped sclerites anteriorly near confluence of common oviduct. ♂♂ : (Fig. 71) aedeagus decurved, in lateral view; apex of median lobe with angular apical acuity medially; manubrium of tegmen slightly longer than median lobe; median struts approximately one-half longer than median lobe; internal sac with large, round, horseshoe-shaped sclerite, and a smaller, v-shaped sclerite.

Geographical distribution .— Weevils of this species are known to occur in southern Colorado and eastern Arizona at altitudes between 2,290 and 3,050 metres (Map 14).

Habitat:.— Populations of this species appear, geographically, to be associated with islands of a high elevation biotic community classified as Petran Subalpine Conifer Forest by Brown (1982).

Chorological affinities .— See this topic for *P. schwarzi* , above (Map 14).

Phylogenetic relationships .— This species is the postulated adelphotaxon of *P. schwarzi* (Fig. 79).

Variation.— Note that on specimens of the type series collected in 1935, the elytral setae are broad, spatulate, and blunt ended. On specimens of the series I collected at the type locality, in 1987, the elytral setae are visibly narrower, although flattened and blunt-ended also.

Material examined .— In addition to the type series listed above, more than 100 specimens were examined:
UNITED STATES OF AMERICA:
Arizona : Apache Co.: Nutrioso, 5.8 km S, hwy180, 2.7 km E on for. Rd., Hulsey Lake, 2700 metres, 6-Jul-87, T. G. Spanton, Ponderosa pine for., ex.: *Rosa* probably *fendleri* , at night, 8,(TGSZ); Greer, 16 km S., 22-Jun-57, F. Werner& G.Butler, 1,(UAIC); Phelps Bot. Area, White Mtns., 7-Jul-53, A.&H. Dietrich, 1,(CUIC); White Mtns., 6-Jul-33, Parker, 1,(CASC); Colorado: Cumbres Pass, 3050 m., 22-Jun-35, Van Dyke Collection, 2,(CWOB), 82,(CASC); Archuleta Co./Conejos Co. line: nr Cumbres Pass, 15 km NE Chama, 3000 m, NM, 5-Jul-1987, T. G. Spanton, ex: *Symphoricarpos* sp. probably *vaccinioides* , at night, aspen/spruce/fir forest, 9,(TGSC); Mineral Co.: Creede, 2700 m., Aug-1914, S. J. Hunter, 1,(?); Ouray Co.: Ouray, 2290-2440 m., 1-15-Jul-1897, H. F. Wickham, 2,(USNM); San Juan Co.: Silverton, Jul, A. Fenyes coll'n, 1,(CASC).

Panscopus (Nocheles) aequalis (Horn)
(Map 15, Figs. 23, 49)

Nocheles aequalis Horn 1876:55.

Nocheles cinereus Horn 1876:55 [in key, *lapsus calami* for *aequalis*]

Nocheles vestitus (Casey) 1888:251

Panscopus (Neopanscopus) aequalis . Pierce 1913:397. Buchanan 1927:28. Schenkling and Marshall 1931:40. Buchanan 1936:13. Blackwelder 1939:66.

Panscopus aequalis . Hatch 1971:290. O"Brien and Wibmer 1982:62.

Type material .— Lectotype (MCZ No. 2818), bears a label "Col.", perhaps indicating that it was collected in Colorado?, and "Horn Coll. H 8279" "N. aequalis H.".

Derivation of specific epithet .— The Latin word *aequalis* means like, same, uniform. This could refer to the topographically even elytral intervals, or the almost uniform rows of fine setae on the elytra.

Diagnosis .— The combination of having all elytral intervals equally convex, the alternate intervals not raised above the even intervals, the thin, semi-erect, acute setae in rows on all elytral intervals and the coarse rugose-tuberculate surface of the pronotum, with tubercles visible through the vestiture, distinguish specimens of *P. aequalis* from all other species of *Panscopus* .

Description .— Size : Length 6.6-8.7 mm (mean=7.3, n=10), width across elytra 2.6-3.5 mm (mean=3.0, n=10). (additional measurements, Table 24)
Colour : grey to grey-brown. Head : transverse impression at base of frons slight; frons and rostrum apparently nearly continuous in lateral view; vestiture of frons and rostrum of dense overlapping grey scales, and decumbent stout blunt setae; nasal plate indistinct; nasal carina obvious, v-shaped.
Antennae: scape short, extended to only anterior quarter of eye; scape with

dense vestiture of scales and coarse setae, integument obscured over most of its length. Pronotum: approximately one-tenth wider than long, lateral margins gently rounded; median longitudinal sulcus incomplete and indistinct, more obvious in anterior half; dorsal surface coarsely rugose; vestiture of overlapping grey scales and scattered, decumbent setae. Elytra : broadly oval in dorsal view, combined width approximately on-half wider than pronotum, and approximately 72% of elytral length; declivity in lateral view, broadly, continuously rounded to reflexed apex; all elytral intervals equally, slightly convex, each interval with complete row or partially double row of semi-erect, fine, acute setae; serial punctures each with scale, scales of serial punctures oval, in some slightly angular apically; elsewhere vestiture of pale grey scales or with patches of beige-coloured, overlapping, striate scales. Legs: tibiae 1, 2, and 3 with row of stout spines on ventral edge in distal third, more pronounced on tibiae 1 and 2; tibia 3 very slightly bent, corbellar area closed. Abdomen: sternum 1 of females slightly convex at middle; abdominal sterna with vestiture of grey scales similar to those of dorsum. Genitalia: ♀♀ (Figs 23, 49): sternum 8 (spiculum ventrale) with apical expansion approximately one third of its length; coxites angular in dorsal view; bursa copulatrix membranous, with pair of crescent-shaped sclerites near confluence with common oviduct; spermatheca sickle-shaped, broad, tapered toward apex in distal half.

Life History Data .— Of the 467 specimens examined which bear collection dates on labels, most (160) were collected in the month of June; 151 were collected in May; 68 in July; 59 in August; 23 in April; and 6 in March.

Host plant associations .— Plant associations taken from label data are as follows: 19 specimens from *Artemisia rothrocki* , four specimens from Rabbitbush (*Chrysothamnus*), four specimens from Rose (*Rosa*), three from *Salix*, and one from each of *Populus tremuloides* and alfalfa.

Geographical distribution .— This species of the basin and range region of interior western North America, exhibits the broadest range, both geographically and altitudinally, of any species of *Panscopus* . *P. aequalis* is a species . The range of the species is bounded in the west by populations in eastern and northern California, eastern Oregon and Washington, and the dry valleys of southern British Columbia east across southern Alberta, Saskatchewan, and southwestern Manitoba, to North Dakota, Montana, Wyoming, Kansas (doubtfully), and Colorado, Utah and Nevada (Map 15). Available altitude records vary from a low of 910 metres near Strathmore in southern Alberta, to the highest from the arid east side of the Sierra Nevada of California where specimens have been taken from elevations between 2,100 and 3,200 metres. Altitude records from localities in Idaho, Montana, Wyoming, and Oregon vary from 1,520 to 2,290 metres. There is an isolated record from an altitude of 2,900 metres in the Ruby Mountains of northeastern Nevada.

Phylogenetic relationships .— *P. aequalis* is the postulated adelphotaxon of *P. squamifrons* (Fig. 79).

Chorological affinities .— The range of this species overlaps completely the range of *P. squamifrons* (Maps 15 and 16).

Material examined .— In addition to the type material listed above, approximately 525 specimens were examined:

CANADA:
Alberta: Calgary, 3-May-53, B.F. & J.L. Carr, 1.(JLCC); Calgary, 16-Jun-56, B.F. & J.L. Carr, 1,(JLCC);"Calgary, Can. N.W.T.", 17-May-?, ex Wickham coll'n., 1,(USNM); Cardston, ?, H.L.Scamans, 1,(CNCI); Cypress Hills, 10-Jun-32, O.Bryant, 1,(CASC); Cypress Hills, 2-Jun-56, B.F. & J.L. Carr, 1,(JLCC); Drumheller, 21-Jun-54, B.F. & J.L. Carr, 1,(JLCC); Edmonton, 26-Jun-19, F.S.Carr, 1,(CNCI); Empress, 11.2 km S. AB/SK border, 14-May-73, 20-May-73, B.F. & J.L. Carr, 2,(JLCC); Ghost Dam, 5-Jun-73, 3-Jul-74, 26-Jun-78,15-May-85, B.F. & J.L. Carr, 4,(JLCC); Gleichen, 8-May-55, B.F. & J.L. Carr, 2,(JLCC); Highwood River, 31-May-53, B.F. & J.L. Carr, 1,(JLCC); Hilda, 7-May-30, A. T. McClay coll'n, 3,(UCDC); Lacombe, 9-Jun-24, R.D.Bird, 1,(CNCI); Lethbridge, 23-May-30, 12-Jul-30, 19-Jun-30, 3-Jul-29, J.H.Pepper, 4,(CNCI); Medicine Hat. , ?, ?, 1(CWOB); Medicine Hat, 4-Apr-31, 14-Jun-31, A. T. McClay, 3,(UCDC); Medicine Hat, 14-Jul-25, 2-Jun-27, 21-Apr-30, 17-May-30, 25-May-30, 25-Jun-30, A.C.Davis, , 16,(CNCI); Medicine Hat, 9-May-26, Andrews, 3,(KSUC); Medicine Hat, 10-Jun-73, 5-Aug-79, B.F. & J.L. Carr, 2,(JLCC); Medicine Hat, various dates-May, Jun, Jul, 1921-1927, F. S. Carr, 1 (AMNH), 7 (CNCI), 1 (CWOB), 1 (DEUN), 1 (MTEC), 1 (UCDC), 8 (UAIC), 1 (UMAA), 6 (OSUO), 7 (USNM), 2 (CASC), Medicine Hat, 4-11-Jul & 20-Jul-4-Aug-1980, G.Gibson, pantrap, 5,(RSAN); Medicine Hat, 15-Jun-30, J.H.Pepper, 3 (CNCI); Medicine Hat, 4-Jun-32, O. Bryant, 4 (CASC); Medicine Hat, 28-Jun, O. H. Schwab coll'n, 2 (UCDC); Medicine Hat, 12-13-Jun-82, R.S.Anderson, pantrap, 4 (RSAN); Medicine Hat, 21-Jun-23, Shoemaker collection, 10 (USNM); Medicine Hat, 1-May-23, ?, 3 (UMAA); Milk River, 19-May-46, G. A. Hobbs,1(CWOB); Orion, 6-Jun-55, J.R.Vockeroth, 2 (CNCI); Orion, 3-Jun-22, H.E.Gray, 1 (CNCI); Patricia, 4-Aug-23, H.L.Scamans, 1 (CNCI); Strathmore, 3.2 km W, 950 m, 16-Jun-62, C.W.O'Brien, 2 (CWOB); Tilley, 10-Jun-32, O.Bryant, ,2 (CASC); Tp. 1 Rge. 5, W 4 Mer., 3-Jul-73, B.F. & J.L. Carr, 1 (JLCC); Tp. 2 Rge. 5, W. 4 Mer., 18-May-80, B.F. & J.L. Carr, 1 (JLCC); Tp. 8 Rge. 18, W. 4 Mer., 21-May-77, B.F. & J.L. Carr, 1 (JLCC); Tp. 11, Rge. 1, W. 5 Mer., 8-May-76, B.F. & J.L. Carr, 1 (JLCC); Tp. 13, Rge. 13, W. 4 Mer., 24-May-81, B.F. & J.L. Carr, 1 (JLCC); Tp. 15, Rge. 14, W. 4 Mer., 10-May-81, B.F. & J.L. Carr, ,1(JLCC); Tp.21 Rge. 4, W. 4 Mer., 30-Jun-73, B.F. & J.L. Carr, 1 (JLCC); Tp. 22, Rge. 1, W. 4 Mer., 20-May-73, B.F. & J.L. Carr, 2 (JLCC); Waiparous, 11-Jul-58, B.F. & J.L. Carr, 2 (JLCC); Sylvan Lake, 21-Jun-43, 28-Jun-43, E. J. Kitely, 23 (CNCI); British Columbia: Aspen Grove, 13-May-34, H.B.Leech, *Populus tremuloides* leaves, 1 (CASC); Aspen Grove, 19-May-31, J.R.Howell, 1 (CASC); Aspen Grove, 14-Jul-22, 24-Jun-22, 29-Jun-22, P.N. Vroom, 5 (CNCI); Cawston, 3-Jun-17, 5-May-17, 14-Jun-17, W. R. S. Metcalfe, 3 (CNCI); Chilcotin, 9-Jun-29, 14-Jun-31, G.J.Spencer, 2 (SMDV); Creston, 22-May-59, G.Stace-Smith, ,1 (SMDV); Kamloops, 1-May-32, O.Bryant, 5 (CASC); Kamloops, Lac duBois, 18-22-Jun-54, G.J.Spencer, 2 (SMDV); Keremeos, 21-Jun-23, C.B.Garrett, 1 (CNCI); Marysville, 3-Jun-58, F. Fodor, 2 (SMDV); McLeod Meadows, 22-Jul-71, J.M.&B.A Campbell, 1 (CNCI); Meritt, Midday Valley, 29-May-24, Culler, ,1 (CNCI); Meritt, Midday Valley, 9-Jun-24, 15-Jun-24, 3-Jul-24, 15-Aug-24, K.F.Auden, 1 (CNCI), 1 (SMDV), 3 (CASC); Merritt, Midday Valley, 6-May-23, R.Hopping, 1 (CASC); Osoyoos, 22-May-24, R.Hopping, 1 (CASC); Osoyoos, Richter Pass", 24-May-59, L.A.Kelton, 1 (CNCI); Osoyoos, Richter Pass, 22-May-59, R.E.Leech, 2 (CNCI); Penticton, 14-Jun-55, R.Stace-Smith, 1 (SMDV);. Princeton, 19.3 km E., 30-Mar-41,

H.B.Leech, 1 (SMDV); Princeton, 13 km E., 24-Aug-77, K. Walde, steppe w Ponderosa pine, 1 (UASM); Quesnel, 14-Jul-48, G.J.Spencer, 1 (SMDV); Radium, 4&7-Jun-53, B.F. & J.L. Carr, 2 (JLCC); Spences Bridge, 18-May-32, G.Stace-Smith, 1 (SMDV); Summerland, 20-Apr-42, S. Wilson, 1 (BMNH); Summerland, 3-Jun-32, 22-May-31, A.N.Cartrell, 2 (CNCI) Summerland, 10-May-06, J.R.Anderson, 4 (CNCI); Summerland, 20-Apr-42, ?, 1 (FMNH); Manitoba: Aweme, 24-Jun-15, N.Criddle, 1 (CNCI); Treesbank, 19-May-25, N.Criddle, 1 (CNCI); Saskatchewan: Attons Lake, Cut Knife., ?-Jun-40, A.R.Brooks, 2 (CNCI); Cypress Hills, 2-Jun-39, A.R.Brooks, ,3 (CNCI); Earl Grey, 28-Apr-25, J.Ritchie, 1 (CNCI); Hague, 17-May-24, Kenneth M. King, 1 (CNCI); Oxbow, 16-May-07, Fred K. Knab, 1 (USNM); Rosthern, 16-May-24, Kenneth M. King, 1 (CNCI); Rutland, 2-Aug-40, A.R.Brooks, 1 (CNCI); Saskatoon, 9-Jun-23, N.J.Atkinson, 1 (CNCI); Saskatoon, 26-Apr-27, 22-Jun-28, Kenneth M. King, 2 (CNCI); Saskatoon, 1-Jun-06, T.N.Willing, 1 (CNCI); Val Marie, 13-Jun-55, J.R.Vockeroth, 1 (CNCI);

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California: Alpine Co., Markleeville, 5 km SE 1680 m, 10-Jun-66, C. W. O'Brien, at night, 21 (CWOB), 2 (RSAN); Alpine Co., ?, Jul-34, J.E.Blum, 1 (CASC); Inyo Co.: Crooked Ck Nat Res Sta, 1.6 km W. White Mts 10,000, 4-Aug-66, L. & C. W. O'Brien, *Artemesia rothrocki* , night, 17 (CWOB); Crooked Ck Nat Res Sta, 1.6 km W. White Mts 3200 m 4-Aug-66, L. & C. W. O'Brien, at night, 3 (CWOB); Crooked Ck Nat Res Sta, 8 km S. White Mts 3050 m, 7-Jul-66, L.&C.W. O'Brien, 2 (CWOB); Crooked Ck Nat Res Sta, 8 km S. White Mts 3090 m, 20-Jun-61, G. W. Frankie, 2 (CWOB); Crooked Ck Nav Res Sta,1.6 km W, White Mtns.3050 m, 4-Aug-66, L.&C.W.O'Brien, 4 (CWOB); Crooked Ck Nav Res Sta. White Mtns. 3050 m, 4-Aug-66, C.W.O'Brien, 18 (CWOB); Lassen Co., Doyle, 31-May-46, A. T. McClay, 1 (UCDC); Lassen Co.: Hallelujah Jct., 28-May-66, C. R. Kovacic, 1 (UCDC); Hallelujah Jct., 7-Jun-68, S.M.Hogue,R.L.Penrose,*Salix* , 3 (UICM); Mono Co.: Bodie , , Wickham, 3 (USNM); Bodie 2580 m, 1-Jul-07, Wickham, 4 (USNM); Bridgeport, 12 km W. 2100m, 6-Jul-66, C. W. O'Brien, 2 (CWOB); Mono Lake, ?-May-20, 10-Apr-21, Corinne Hilton, 2 (CASC); Mono Lake 1940 m, 2-Jul, Wickham, 1 (USNM); Sherman Creek, 29-Jun-55, ?, 1 (CWOB); Tom's Place 6.4 km SW, 13-Jul-61, J. S. Buckett, 1 (UCDC); White Mtns. 3050 m., 23-Jun-61, D. R. Miller, 1 (UCDC); White Mtns., Blanco's Corral, 3050 m, 23-Jun-53, W. D. McLellan, 2 (UCDC); Mono Lake, Tioga Lodge, 22-Jun-29, E.P.Van Duzee, 1 (CASC); Nevada Co.: Boca, 3-Jul-54, R. C. Baylock, 1 (UCDC); Nevada City, 27-May-41, A. T. McClay, 2 (UCDC); Placer Co.: Truckee 1770 m, Aug, Wickham, 1 (USNM); Plumas Co.: Graeagle, 15-Jun-49, E.L. Schlinger, 1 (UCDC); Tuolumne Co.: Chipmunk Flat, 9-Aug-60, T. Gantenbein, 2 (UCDC); CA, , ?, ?, ?, 1 (USNM): "Cal.", ?, H. W. Wenzel coll'n, 2 (OSUC); Rifle, 5-May-05, ?, 1 (INHS); Tallac, 3-Jul-48, A.Fenyes collection, 1 (CASC); Colorado: Rio Blanco Co., Greasewood-Sage Site, #83A PF88 1950 m , Jul-75, B.E.King for RBOSP, Rabbitbush, 2 (CWOB); Greasewood-Sage site #83A 1950 m, Aug-75, B. E. King, on Rabbitbush, 2 (CWOB); Idaho: Bannock Co.: , 20-Jun-75, A. D. Allen, 1 (CWOB); Blaine Co.: Shoshone, 32 km N, Big Wood River, 1-Jul-66, W. Gagne, at night, 1 (CWOB); Fremont Co.: Island Park, 1-Jul-78, G.A.Shook, 1 (CIDA); Nez Perce Co.: Lewiston 1670 m, 15-Apr-36, V. E. Nygren, 1 (UICM); Id.,no locality or date, Horn, 2 (MCZC); Dillon Mtn.? Id. Exp. Sta., 11-Jul-28, C.

Wakeland, 1 (UICM); Kansas?: "Ks", ?, 1 (INHS); Montana: Cascade Co.: Cascade, 4.8.52, ?, taken from furniture, 1 (USNM); Cascade, ?, 1 (USNM); Gallatin Co.: 1520 m, ?, A.D.Hastings, 1 (USNM); Bozeman, 22-Jun-20, T.R.Chamberlain, "alfalfa, swept", 1 (OSUO); Bozeman, 1-May-27,16-Jun-08, collectors?, 2 (MTEC); Gallatin Co., , 8-Jun-54, Student coll'n, 1 (MTEC); Granite Co.: Phillipsburg, 17.7 km. S., 11-Jul-55, R. C. Froeschner, 1 (MTEC); Ravalli Co.: Hamilton, 18-Jun-28, 1 (MTEC); Roosevelt Co.: Poplar, 19-Jul-56, R. C. Froeschner, 1 (MTEC); Rosebud Co.: Forsyth, 26-Jun-03, ?, 1 (USNM); Yellowstone Co.: Huntley, 11-Jul-14, 1 (MTEC); Unknown counties or localities: "Mon", Nason coll'n, 2 (INHS); "Mont.", ?, G.M.Greene, 2 (USNM); "Mont.", ?, Boulter coll'n, 1 (INHS); "Montana", ?, ?, 1 (INHS); Mt, ?, 22-Jun, 1 (MTEC); North Dakota: Billings Co.: Kadr. Dam, 10-Jun-45, D. Aarhus, 1 (NDSU); Bottineau Co.: Willow City, 17-Jun-77, Robert Gordon, 2 (USNM); McKenzie Co.: , Theo. Roos. Mem. Prk., 7-Jun-65, D. Aarhus, window-pane trap, 1 (NDSU); Morton Co.: Flasher Loc. No. 13, 13-Jul-66, R.J.Sauer, vacuum sweeper, 1 (NDSU); Wells Co.: ?, Mar, ?, , , , 1 (NDSU); Williams Co.: Williston, 8-9-May-19, Wickham, 1 (USNM); Slope 6, 13-Jul-65, ?, 1 (NDSU); Nevada: Elko Co.: Carlin, ?, ?, 1 (USNM); Elko, ?, Wickham, 1 (USNM); Ruby Mtns., Fauve Lake, 7,8&12-Jul-34, H. B. Stafford, 4 (EMUS); Fauve Lake, Ruby Mtns. 2900 m, 7&12-Jul-34, H. B. Stafford, 3 (USNM); Washoe Co.: Verdi, 9-Jul-67, W.Gagne, 4 (CWOB); unknown counties: "Nev.", ?, Hubbard&Schwarz, 2 (USNM); "Nev."", ?, 1 (USNM); NV, , ?, 1-Jul-29, O. H. Schwab coll'n, 1 (UCDC); Carson city, 25-Jun-29, R.L.Usinger, 1 (CASC). Oregon: Crook Co., Prineville, 30-Jun-46, A. T. McClay, 1 (UCDC); Deschutes Co.: Tumalo State Park, 22-Jun-54, K.M. Fender, 1 (OSUO); Harney Co.: Burns, Jun-19?, B.G.Thomson, 1 (OSUO); Burns, 24 km. N., hwy 395, 18-Jun-84, B.F. & J.L. Carr, 1 (JLCC); Fish Lake, Steens Mtns. 2160 m, 15-Jul-62, 1 (USNM); Snake River, Olds Ferry, 20-Apr-37, M.C. Lane, 1 (OSUO); Steens Mtns. Fish Lake. 2290 m, 20-Jul-55, J.E.Baker, 1 (AMNH); Steens Mtns. Fish Lake. 2290 m, 22-26-Jun-51, Borys Malkin, 3 (OSUO); Steens Mtns. Fish Lake. 2290 m, 3&4-Jul-47, F.Ellertson, 2 (OSUO); Steens Mtns., 6.4 km. W. Fish Lake, 15-Jul-53, Roth & Beer, 1 (OSUO); Steens Mtns., Fish Lake, 15-Jul-53, Roth & Beer, 2 (OSUO); Steens Mtns. Rocky Hill 2160 m, 15-Jul-62, J. F. G. Clarke, 1 (USNM); Lake Co.: Goose Lake, ? 1923, ?, 1 (USNM); Malheur Co.: Harper, 21-May-35, 10-May-38, M.C.Lane, 2 (OSUO); Harper, 10-May-38, E. W. Jones, 3 (UICM); Ironsides, 21-May-35, M.C.Lane, 1 (OSUO); Wasco Co.: The Dalles, 11.3 km E., 10-Apr-69, R. L. Westcott, sandy habitat, 2 (ODAC); The Dalles, 21-Mar-54, S. & M. Sargent, ,3 (FMNH); Utah: Beaver Co.: Beaver Valley, 13-Jun, ?, 2 (USNM); Uintah Co.: Vernal, 1-May-52, N. R. Merrell, 1 (CWOB); unknown counties: "Ut", ?, J.B.Smith collection, 2 (USNM); Washington: Chelan Co.: Chelan Falls, 26-Apr-11, Wash.Expt.Sta.#18, 1 (USNM);Chelan Falls, 26-Apr-11, ?, 1 (WSUC); Grant Co.: Grand Coulee, 2-Apr-33, J.F.G.Clarke, 1 (OSUO); Grand Coulee, , ?, 1 (OSUO); Grand Coulee, 2-Apr-33, I.W.Bates, 4 (WSUC); Okanagan Co.: Brewster, 1 & 12-May-12, Wash.Expt.Sta.#18, 2 (USNM); Brewster, 1-May-12, ?, 1 (WSUC); Brewster, 17-Jun-54, D. Boddy & B. Malkin, 2 (FMNH); Okanagan, 4, 8, &14-May-12, Wash.Expt.Sta.#18, 1 (USNM), 3 (WSUC); Okanagan, 8-May-12, ?, 1 (BMNH); Omak, 3-May-12, ?, 1 (USNM); Oroville, 10-May-12, ?, 1 (USNM); Oroville, 24-Jun-12, Wash.Expt.Sta.#18, 2 (WSUC); Tonasket, 2-May-11, ?, 1 (OSUO); Tonasket, ?, M.A.Yothers, 1 (OSUO); Tonasket, 2-May-11,

Wash.Expt.Sta.#18, 2 (USNM), 18 (WSUC); Tonasket, 12-May-?, ?, 22 (WSUC); Tonasket, 12-May-?, M.A.Yothers, 7 (WSUC); Walla Walla Co.: Wallula, 28-May-24, M.C.Lane, 1 (USNM); Whitman Co.: Hooper, 14-Jun-32, M.H.Hatch, 1 (OSUO); Pullman, ?, C.V.Piper, 1 (USNM); Wawawai, 14-Mar-10, ?, 1 (UCDC); Wawawai, ?, C.V.Piper, 7 (USNM), 10 (WSUC); Wawawaii, 8-May-57, G. N. Knopf, 1 (UICM); Yakima Co., Toppenish, 26-Apr-26, F.H.Shirck, 1 (OSUO); unknown counties:"Was.", 26-Apr-11, Van Dyke collection, 1 (CASC); Mission, 5-May-11, Wash.Expt.Sta.#18, 3 (USNM); "Rainier Ntl. For., Indian Flat Camp.", S.E.Crumb, 1 (OSUO); Wash. Exp. Sta. Mission, 5-May-11, ?, 1 (USNM); Wyoming: Carbon Co., ?, ?, Van Dyke collection, 1 (CASC); Johnson Co.: Barnum, 4-Jun-82, B.F. & J.L. Carr, 1 (JLCC); Buffalo, 12.9 km W., 20-Jun-68, S.L.W., 1 (WECC); Lincoln Co.: Frontier, 6.4 km NW, 26-Jun-66, W. Gagne, at night, , 2 (CWOB); Sublette Co.: Big Sandy Reservoir, 25-Jun-82, B.F. & J.L. Carr, 1 (JLCC); Sweetwater Co.: Green River, 1889?, Wickham, 1 (CASC); Teton Co., Grand Teton N.Pk., Gros Ventre Camp., 24-Jun-66, W.Gagne, at night, 2 (CWOB); Grand Teton N.Pk., Jackson Hole Res.Sta. 2040 m, 4-Aug-67, H.E. & M.A Evans, 3 (USNM); Teton, 13-May-31, A. R. Rolfs, 1 (USNM); unknown counties: "Nat.Pk., Wyo", 1-Aug?, Hubbard & Schwarz, 1 (USNM); "Wy.", ?, Chas. Palm collection, 1 (AMNH); Yellowstone National Park, 19-Jul-45, , Bunchgrass-sage, 1 (USNM); Unknown country, state, locality: 22-Jun-03, P.B.G., 1 (UASM).

Panscopus (Nocheles) squamifrons Pierce
(Map 16, Figs. 24, 50, 72)

Panscopus (Neopanscopus) squamifrons Pierce 1913-397. Buchanan 1927:29. Schenkling and Marshall 1931:41. Buchanan 1936:13. Blackwelder 1939:66.

Panscopus (Neopanscopus) wickhami Buchanan 1936:13. **new synonymy** Blackwelder 1939:66.

Panscopus squamifrons . O'Brien and Wibmer 1982:63.

Panscopus wickhami . O'Brien and Wibmer 1982:63.

Type material .— Holotype ♀ : "Placer / Co. Cal.; June ; Through / C. V. Riley; TYPE / No. 14644 / U.S.N.M.; Panscopus / squamifrons / Type Pierce" I have also examined the holotype of Buchanan's (1936) *wickhami* , bearing the following label data: "Truckee Cal. Aug. 5800 ft. Wickham; Wickham collection 1933; TYPE U.S.N.M. 50651; Panscopus (Neopanscopus) wickhami/ ♂ TYPE Buch."

Notes about synonymy .— The holotypes of *P. squamifrons* Pierce and *P. wickhami* Buchanan are clearly conspecific. Buchanan (1936) based his description of *P. wickhami* on a very small male. The characters he cites– elytral intervals subplanate, setae short and inconspicuous, and the prothorax as long as wide– are all found within the range of individual variation among specimens in several population samples of this taxon. I have seen no external characters, or genitalic characters to suggest a reason for recognizing two species.

Derivation of specific epithet .— From the Latin words *squama* , scale, and *frons* , brow, or face, referring to the scale-covered frons which is typical of this and other species of *Panscopus* .

Diagnosis .— The combination of all elytral intervals equally convex, alternate intervals not raised above even intervals, and thin, semi-erect, acute setae in rows on all elytral intervals separate specimens of *P. aequalis* and *P. squamifrons* from those of other species in the subgenus *Nocheles* . Specimens of *P. squamifrons* are distinguished by their smooth pronotal surface, in contrast to the coarsely rugose pronotal surface exhibited by representatives of *P. aequalis* .

Description .— Size : ♀♀ : Length 5.2-6.0 mm (mean=5.7, n=7); width across elytra 2.2-2.6 mm(mean=2.4, n=7). ♂♂ : Length 5.6-6.3 mm (mean=5.9, n=8); width across elytra 2.1-2.3 mm (mean=2.2, n=8); (other measurements, Table 25). Colour : Grey-brown overall. Under magnification, irregular patches of pale grey scales, and areas of brown scales Head : transverse impression at base of frons slight; frons and rostrum nearly continuous in lateral view; vestiture of frons and rostrum of dense overlapping grey scales, and decumbent stout blunt setae; nasal plate indistinct; nasal carina obvious, broadly curved, more U-shaped than V-shaped. Antennae: scape short, extended to middle of eye; scape with dense vestiture of scales and coarse setae, integument obscured over most of its length. Pronotum: nearly as long as wide- width only 4% greater than length in males; in females proportionately wider, width approximately 10% greater than length; median longitudinal sulcus absent, dorsal surface smooth; vestiture of overlapping grey and brown scales and scattered, decumbent setae. Elytra : broadly oval in dorsal view, combined width approximately 72% of length, and approximately 42% wider than pronotum in females; proportionately narrower in males, combined width 68% of length on average, and 40% wide than pronotum; declivity continuously rounded to reflexed apex; all elytral intervals equally, slightly convex, each interval with complete row or partially double row of semi-erect, fine, acute setae; serial punctures each with scale, scales of serial punctures oval, in some slightly angular apically; elsewhere vestiture of pale grey scales or with patches of beige-coloured, overlapping, striate scales. Legs: tibiae 1, 2, and 3 with row of stout spines on ventral edge in distal third, more pronounced on tibiae 1 and 2; tibia 3 very slightly bent; corbellar area narrowly and indistinctly closed. Abdomen: sternum 1 of females slightly convex at middle; sternum 1 of males concave at middle; abdominal sterna with vestiture of grey and brown scales similar to those of dorsum. Genitalia: ♀♀ (Figs 24, 50): sternum 8 (spiculum ventrale) with apical expansion approximately one third of its length; coxites angular in dorsal view; bursa copulatrix membranous, with pair of crescent-shaped sclerites near confluence with common oviduct; spermatheca sickle-shaped, broad, tapering toward apex in distal half. ♂♂ : (Fig. 72): median lobe of aedeagus short, decurved,; apex broadly rounded; manubrium of tegmen about as long as median lobe; median struts slightly longer than median lobe; internal sac membranous, without fields of visible denticles; with one large horseshoe-shaped sclerite, and small v-shaped sclerite within it, both near apex of sac (located anteriorly to belt of tegmen in inverted sac).

Life History Data .— Label data of approximately 225 specimens I have examined indicate that adult specimens have been collected in the months of April through August. More specimens were collected in the months of June and July than in other months of the year.

Host plant associations .— Plant names associated with specimens of *P. wickhami* are twenty two specimens taken from *Artemisia* litter, one specimen taken from *Symphoricarpos* sp., probably *vaccinioides,* and one specimen collected under Jeffrey pine.

Geographical distribution .— Weevils of this species occur in the central Sierra Nevada of eastern California, north to the Cascade Mtns. of southern Oregon (Map 16). The available altitude records range from 1,680 to 2,650 metres.

Phylogenetic relationships .— *P. squamifrons* is the postulated adelphotaxon of *P. aequalis* (Fig. 79).

Chorological affinities .— See this topic for *P. aequalis* above (Maps 15 and 16).

Material examined .— In addition to the type material listed above, approximately 225 specimens were examined, as follows:
UNITED STATES OF AMERICA:
California: Alpine Co., Jul-34, W. H. Nutting, 1 (CNCI); Amador Co., Pioneer, 45 km NE 2260 m, 18-Jul-66, L.&C.W. O'Brien, 1 (CNCI); Pioneer, 45 km. NE, 8-Jul-66, L. & C. W. O'Brien, at night, 1 (CWOB); Eldorado Co.: Tallac, Aug-?, Blaisdell coll'n, 1 (CASC);Tallac, 3-Jul-1898, A. Fenyes coll'n, 2 (CASC); Eldorado Co., ?, , Van Dyke coll'n, 1 (CASC); Fallen Leaf Lake, Lk. Tahoe, 12-Jul-15, Van Dyke coll'n,1 (CASC); Lake Tahoe, 19-Jun-36, L. H. Rich, 1 (USNM); Lassen Co.: Facht, 27-May-, J. O. Martin, 26 (CASC); Facht, 27-May-22, J. O. Martin, 30 (CASC); Facht, 20-May-22, J. O. Martin, 11 (CASC); Facht, 20-Jun-22, J. O. Martin, 1 (CASC); Norval Flats 1680 m, 12-Jul-20, ?, 2 (CASC); Norval Flats 1680 m, 12-Jul-20, J. O. Martin, 8 (CASC); Mono Co.: Bodie 2580 m, 1-7 July ?, Wickham, 1 (USNM); Bridgeport, 12 km W. 2100 m, 6-Jul-66, C. W. O'Brien, 1 (AMNH), 7 (CWOB), 1 (NMDC), 1 (OSUC); Mono Co.: Sonora Pass Summit, 5.5 km E. 2650m, 23&24-Jun-86, T. G. Spanton, *Symphoricarpos* sp., prob. *vaccinioides* , at night, temp 5°C, 2, (TGSC); Sonora Pass Summit 5.5 km E. 2650m, 23&24-Jun-1986, T. G. Spanton, "ex *Artemisia* sp., at night, temp 5°C, , 3, (TGSC); Nevada Co.: Boca, 3-Jul-54, R. C. Blaylock, 1 (UCDC); Boca, 3-Jul-54, R. H. Goodwin, 1 (CWOB); Boca, 3-May-54, J. A. Powell, 1 (CWOB); nr. Hobart Mills, 23-Jun-62, R. L. Westcott, 6(LACM); Prosser Ck. 1 mi S Hobart Mills 1770 m, 18-Jun-66, C. W. O'Brien, at night, 15 (CWOB); Prosser Ck, 1.6 km W. Hobart Mills 1770 m, 18-Jun-66, W. Gagne, at night, 3 (CWOB); Prosser Ck, 1.6 km W. Hobart Mills 1800 m, 17-Jul-65, Edward L. Smith, 1 (CWOB); Sagehen Creek, 21-Jun-78, L. D. French, 1 (UCDC); Sagehen nr. Hobart Mills, 5-Jul-62, C. A. Toschi, 1 (CNCI), 3 (CWOB); Upper Sagehen Creek, 5-Jul-62, J. Powell, 1 (CWOB); Placer Co.: Truckee, 17-Jun-27, E. P. Van Duzee ,4 (CASC); Truckee, 30-May-46, A. T. McClay coll'n, 13(UCDC); Truckee, 30-Jun-46, A. T. McClay, 13 (UCDC); Sierra Co.: Sierraville, 5 km. S., 18-Jun-66, C. W. O'Brien, at night, 2 (CWOB); Sierraville, 8 km S., 18-Jun-66, W.Gagne,C.W.O'Brien, at night, 1 (BMNH), 1 (CNCI), 2 (RSAN), 12 (CWOB); Webber Lake, 4 mi E., 19-Jul-39, W. F. Barr, 2 (USNM); Webber Lake, 3 mi E, 19-Jul-39, W. F. Barr, 64

(UICM); Unknown counties: Angora L Tahoe, 22-Jun-15, Van Dyke coll'n,1 (CASC); Bijou Lk. Tahoe, 27-Jun-29, E. P. Van Duzee, 1 (CASC); Lake Alpine, 26-Jun-35, R. P. Allen, 1 (CASC); Nevada: Washoe Co.: Mt. Rose, 9-Jul-64, D. F. Veirs, 1 (CWOB); unknown county: Spooner Summit hwy 50, 2130 m, 13-Jul-58, F. Raney, under Jeffrey pine, 1 (CWOB); Oregon: Harney Co., Lilly Lake, Steens Mts. Summit Rd. 24km E of Frenchglen, 29-Jul-71, Benedict, leaf litter, 1 (HAHC); Steens Mtns. Fish Lake, 15-Jul-62, J. Baker, 1 (USNM); Klamath Co.: Algoma, Upper Klamath Lake, 11-Apr-62, Joe Schuh, *Artemisia* litter, 12 (AMNH), 5 (NMDC), 6 (OSUO). Union Co.: No. Powder, 8-Jun-24, 2 (USNM).

Panscopus (Nocheles) abruptus (Casey)
(Map 17, Figs. 25, 51, 73, 76)

Nomidus abruptus Casey 1895:819 [type of monobasic genus, Casey 1895]. Pierce 1913:395.

Panscopus (Nomidus) abruptus . Buchanan 1927:29. Schenkling and Marshall 1931:41. Buchanan 1936:15. Blackwelder 1939:66.

Panscopus abruptus. Hatch 1971:290. O'Brien and Wibmer 1982:63.

Type material .— Holotype ♀ (USNM No. 34946) Cal., Casey bequest 1925.

Derivation of specific epithet .— The Latin word *abruptus* means broken off, precipitous, steep. This is probably in reference to the cliff-like, undercut shape of the elytral declivity in lateral view.

Diagnosis .— A median longitudinal carina in the apical half of the prementum distinguishes this species and *P. rugicollis* from all other species of *Panscopus* . The non-setose even elytral intervals distinguish *P. abruptus* from *P. rugicollis* .

Description .— Size : ♀♀ : Length 7.4-9.7 mm (mean=8.3, n=10), width across elytra 2.9-3.6 mm (mean=3.2, n=10); ♂♂ : length 6.9-8.4mm (mean=7.4, n=10), width across elytra 2.5-2.9mm (mean=2.6, n=10); (other measurements, Table 26). Colour : very dark brown or nearly black, to the unaided eye; patches of lighter coloured scales and setae postero-laterally on pronotum, elytral humeri, and supra-orbitally on head; pale scales on ventral sterna, coxae, and dorsal and ventral margins of femora and tibiae. Head : broad transverse impression at base of frons slight; rostrum and frons apparently continuous in lateral view; rostrum without carinae visible through vestiture; nasal plate indistinct, some scales inserted in area of plate; nasal carina broadly U-shaped in most specimens, vestiture of frons and rostrum of dense, overlapping, striate scales, and scattered, decumbent, broad, flattened setae. Mouthparts: prementum with median longitudinal carina in apical half. Antennae: scape short, extended to only anterior margin of eye, with integument concealed by vestiture over most of its length; funicular annuli each with long dark primary setae, apically directed, and short, fine, lighter coloured appressed secondary setae, integument clearly visible through vestiture. Pronotum : broadly rounded laterally, approximately 15% wider than long, in females; proportionately narrower, only 7% wider than long, in males; dorsal surface coarsely rugose; median longitudinal sulcus complete, or shallow and indistinct

posteriorly in some specimens, deeper and more obvious in anterior half. Elytra : broadly curved laterally, combined width approximately 70% of length and 45% wider than pronotum; proportionately narrower in males, approximately 65% of length and 37% wider than pronotum; in lateral view apex of elytron straight, reflexed ventrally; alternate intervals slightly elevated, with double, or partly triple row of decumbent, short, blunt setae; even intervals flat, without setae; serial punctures each with broad round scale, larger than surrounding scales; elsewhere with vestiture of dense overlapping striate scales. Legs : tibiae 1, 2, and 3 with a few stout, dark brown spines on ventral margin, in distal half, tibia 3 curved, corbellar area closed, indistinctly. Abdomen : sternum 1 convex at middle in females, concave at middle in males. Genitalia : ♀♀ : (Figs. 25, 51) sternum 8 with apical expansion approximately 1/3 of length; coxites narrowing angularly toward apex in dorsal view, rounded apically in lateral view; stylus with 2 or 3 primary setae apically; bursa copulatrix with pair of curved sclerites crescent-shaped. ♂♂ : (Figs. 73, 76) aedeagus slightly decurved, angular at apex with median apical acuity in postero-dorsal view; manubrium of tegmen, and median struts of aedeagus, each slightly longer than median lobe; internal sac membranous, horseshoe-shaped sclerite elongate; small v-shaped sclerite internal to horseshoe-shaped sclerite, in dorsal view.

Life History Data .— Most (331) of the 380 specimens examined were collected in the months of June and July. Thirty-three specimens were collected in the month of May, three in each of February, and August, two in each of April and November and one in September.

Host plant associations .— Host plant taxa indicated from labels of borrowed specimens are as follows: eight specimens from *Vaccinium,* Two from *Abies* , one from *Abies concolor* , one from pine, and one from Jeffrey pine.

Geographical distribution .— Weevils of this species are known to occur in southern British Columbia, the Cascade Mtns. region of Washington and Oregon States, and in California, as far south as the southern end of the Sierra Nevada (Map 17). Available altitude records range from 610 to 2,740 metres. The lowest records are from the northern part of the range in southern British Columbia and the highest figures are from the southern part of the range of the species, where, in the Sierra Nevada altitude records vary form 1,710 to 2,740 metres.

Phylogenetic relationships .— *P. abruptus* is the postulated adelphotaxon of *P. rugicollis* (Fig. 79).

Chorological affinities .— The ranges of this species and *P. rugicollis* overlap greatly (Maps 17 and 18).

Material examined .— In addition to the type material listed above, approximately 380 specimens were examined:
CANADA:
British Columbia:
Copper Mtn., 4-Jul-29, G.Stace-Smith, 1,(CNCI); Manning Prov. Park, East Gate, 610 m, 2.Jun-4.Jul-1984, D. Miller, Pan trap, 1,(RSAN); Merritt, Midday Valley, 3-Jun-24, H.L.Cutler, 1,(CASC); Merritt, Midday Valley, 15-Jun-24, K. F. Auden, ,2,(SMDV):

UNITED STATES OF AMERICA:
California: Amador Co.: Pioneer, 45 km NE. 2260 m, 18-Jul-66, L. & C.W.O'Brien, 24,(CWOB), 2(RSAN); Pioneer, 45 km. N.E., 2260 m, 8-Jul-66, L. & C. W. O'Brien, at night, 22,(CWOB), 1,(KSUC), 1,(NMDC); Eldorado Co.: Desol.Vall.P.A. Midd.Velma Lk 2410 m, 15-Aug-69, A. Smetana, 1,(CNCI); Echo Lake, 22-Jul-41, A. T. McClay, 3,(UCDC); Fallen Leaf Lake, 22-Jun-30, J. F. Brimley, 3,(CNCI); Fallen Leaf Lake, 16,20&22-Jun-30, A.T.McLay, 4,(CASC), 2,(CNCI), 2,(OSUO), 2,(UAIC), 10,(UCDC); Fallen Leaf Lake , 1-Jun-30, O.H. Schwab coll'n, 1,(UCDC); Fallen Leaf Lake 1920 m, two dates-Jun-30, A. T. McClay, 2,(UAIC), 8,(UCDC); Fallen Leaf Lake 1920 m, 21-Jun-30, J.F.Brimley collection, 2,(CNCI); Falling Leaf Camp, Eldorado Nat. For. 1920 m, 21-Jul-66, , Pine, daytime, 1,(CWOB); Huntington Lake, 23,24,25-Jul-40, A. T. McClay, 16,(UCDC); Ice House road, 5-Feb-80, RBKimsey&ROSchuster, 1,(UCDC);Ice House Road, 19.3 km N, 31-May-75, R. W. Brooks, 1,(UCDC); Riverton, 5-Feb-80, RBKimsey&ROSchuster, 2,(UCDC); Strawberry Valley, 13-Aug-12, Van Dyke collection, 1,(CASC); Lassen Co.: Echo Lake 2260 m, 5-Jun-26, F.H.Wymore, 2,(CASC); Facht, 24-Jun-22, J.O.Martin, 1,(CASC); Mt. Lassen Natl. Pk., 15-Jul-45, A. T. McClay, 1,(UCDC); Mariposa Co.: Mariposa Grove, 6-Jun-42, ?, *Abies concolor*, 1,(CWOB); Yosemite Valley, 8-Jul-21, Van Dyke, ,10,(CASC); Nevada Co.: Cisco, 13-Jun-39, M.A.Cazier & G.E.Bohart, 25,(AMNH); Hobart Mills, 23-Jun-62, R. L. Westcott, 3,(LACM); Sagehen Creek 1920 m, 5-Jul-82, P. Timber, pitfall trap, 1,(UCDC); Pacer (Placer?), ?, ?, Van Dyke collection, 1,(CASC); Placer Co.: Lake Tahoe, 28-Jun-31, B.E.White, 5,(CASC); Lake Tahoe, 17-Jun-40, M.A.Cazier,T.Aitken, 4,(CASC); Truckee, 30-May-36, A. T. McClay, 2,(UCDC); Plumas Co.: Chester, 4, 13 & 17-Jun-60, D.J. & J.N. Knull, 9,(OSUC); Chester, 9.7 km NW, 12-Jun-65, Terry L. Erwin, 1,(USNM); Graeagle, 17-Jun-49, Evert I. Schlinger, 1,(UCDC); Meadow Valley, 7-Jun-24, Van Dyke, 4,(CASC); Meadow Valley 1220-1520 m, 5-13-Jun-24, Van Dyke, 76,(CASC); Plumas Co., , 27-Jul-63, T. L. Erwin, on ground, 1,(CWOB); Sierra Co.: Sierraville, 4.8 km S. 1710 m, 18-Jun-66, C.W.O'Brien, 2,(CWOB); Sierraville, 3 mi S. 1710 m, 18-Jun-66, 1,(BMNH); Yuba Pass, 2-Jun-45, A. T. McClay, 1,(UCDC); Sierra City, 16-Jun-40, M.A.Cazier,T.Aitken, 6,(AMNH); Webber Lake, 17-Jun-40, M.A.Cazier, 1,(AMNH); Tahoe Co.: Angora L., 22-Jun-15, R.Hopping collection, 1,(CASC); Trinity Co.: Nash Mine, 1520 m, 14-Jun-13, Van Dyke collection, 1,(CASC); Tulare Co.: Alta Meadow, Sequoia N. P. 2740 m, 19-Jul-07, J.C.Bradley, 21,(CUIC); Sequoia Natl. Park, 5000-7000 ft., 14-Jun-29, A. T. McClay, 1,(UCDC); Sequoia Natl. Pk., Alta Meadow 2740 m, 19-Jul-07, J. C. Bradley, 1,(CUIC); Sequoia Natl.Pk., Wolverton 2130-2740 m, 24-Jun-29, Van Dyke collection, 4,(CASC); Tuolumne Co.: Strawberry, 11 mi N., 24-Jun-51, C. A. Downing, 3,(UCDC); 8 mi NE Twain Hart, 15-26-Jun-1986, F.I.T. T.G.Spanton&B.V.Brown, 3,(TGSC); unknown counties: Meyers, 31-Aug-16, F.B. Herbert, Jeffrey Pine, 1,(USNM); Kirkwood Lake, 17-Jul-46, A. T. McClay, 1,(UCDC);
Idaho: Adams Co.: Cuprum, 3-Jul-68, B.F. ? J.L. Carr, 1,(JLCC); Shoshone Co.: Mullan, 4.8 km. E., 8-Jun-63, David R. Smith, 2,(OSUO); Wallace, 17-Jun-17, O.Huelleman, 1,(OSUO); Valley Co.: Cascade, 23-Jun-38, M.C.Lane, 1,(OSUO); Oregon: Benton Co.: Corvallis, OSU Hort. Farm, 15-May-76, R. Rosenstiel, 1,(CWOB); Mary's Peak, ?, G.F.Moznette, 1,(OSUO); Grant Co.: Dixie Creek Forest Camp, 11-Jul-53, Roth & Beer, 1,(OSUO); Magone Lake

Cpgd. Malheur National Forest, 6-Jun-86, E. Fuller, 1,(TGSC); Hood River Co.: Mt. Hood, Cloud Cap Road, 19-Jul-36, Wm.W.Baker, 1,(OSUO); Mt. Hood, Cloud Cap Road, 8-Jul-36, Crumb, 1,(OSUO); Mt. Hood, Homestead Inn, 7-Jul-27, Van Dyke, 2,(CASC); Parkdale, "6-5-72", R.G.Rosenstiel, 2,(AMNH), 1,(OSUO); Jackson Co.; Carberry Creek, 8-Jul-62, J.D.Vertrees, 1,(AMNH); North Fork Cpgd 58km E Medford, hwy 140, 30-Jun-86, T. G. Spanton, 16,(TGSC); Union Creek, 5-Jul-41, A. T. McClay, 8,(UCDC); Klackamas Co.: Govt. Camp, 1.6 km S., 25-29-Jul-66, W. Gagne, *Vaccinium*, at night, 1,(CWOB); Klamath Co.: Crater Lake, 6&19-Jul-38, A. T. McClay, 5,(UCDC); Crater Lake National Park Headquarters, 20-Jul-58, D. H. Huntsinger, #238, 1,(CWOB); Upper Klamath Lake, Geary Canal, 25-May-58, Joe Schuh, 1,(AMNH); Lake Co.: Warner Mts., 20-Jun-22, Van Dyke, 1,(CASC); Linn Co.: Monument Peak L. O. 1430 m, 20-Jul-81, R. L. Westcott, *Vaccinium*, ,3,(ODAC), 4,(RSAN); Santiam Pass hwy 20, 21-Jul-69, Kenneth Goeden, ,1,(ODAC); Marion Co.: Stayton, 11.2 km E., 28-Sep-41, J.C.Chamberlain, Alder & Maple litter, 1,(OSUO); Wallowa Co., Wallowa Lake, 15-Jun-38, Van Dyke, 1,(CASC); Wallowa Lake, 22-Jun-41, ? Fender, 1,(OSUO); unknown counties: Bear Springs, 12-Jun-41, K.M. & I.M. Fender, 1,(OSUO); Bear Springs, Wapinitie Cutoff, 30-Jun-41, K.&D.Fender, 1,(OSUO); Pisgah Spring, Ochoco Nat. For., 18-Jul-71, R. L. Westcott, *Abies*, ,2,(CWOB), 1,(ODAC); Washington: ?, Pacific Beach, 14-May-33, J.Wilcox, 1,(OSUO); King Co.: Bellevue, 14-Aug-36, O.H.Lavers, 1,(OSUO);. Kittitas Co.: Easton, ?, Koebele collection, 1,(CASC); Easton, 14-Nov-31,10-Apr-32, 7-May-33, 11-Nov-31?, J.Wilcox, 4,(USNM); Sawmill Flat Forest Camp, 6-Jul-35, J.Wilcox, 7,(CASC); Sawmill Flat, Rainier Natl. For., 25-May-35, 1-Jun-35, 15-Jun-35, J.Wilcox, 10,(OSUO); Sawmill Flat, Rainier Natl. For., 30-May-36, Wm.W.Baker, 2,(OSUO); Rainier Natl. For., Sawmill Flat, 5-Jul-33, S.E.Crumb, 1,(AMNH), 1,(DEUN), 16,(OSUO); Rainier Natl. For., Sawmill Flat, 25-May-35, J.Wilcox, 4,(OSUO);Yakima Co.: Mt. Adams, "West Klickitat", 17-Jun-25, L.A.Morley, 1,(USNM); Mt. Adams, Bird Creek, Jul-31, I.W.Bales, 1,(WSUC); Mt. Adams, Bird Creek, July 1931, I. W. Bales, 1,(WSUC); Localities of unknown counties in the area surrounding Mt. Rainier: Rainier Natl. Forest, Hell's Crossing", 30-May-35, S.E.Crumb, 2 (OSUO); Rainier Natl. Forest, Hell's Crossing, 30-May-35, J.Wilcox, 18,(OSUO); Rainier Natl. Forest, Hell's Crossing, 15-Jun-35, 8-Jun-35, Wm.W.Baker, 2,(OSUO); Rainier Natl.For., Indian Flat Camp, 26-May-39, S.E.Crumb, 2,(OSUO); Rainier Natl.For., Pleasant Valley, 27-Jun-39, S.E.Crumb, 1,(OSUO); Signal Peak Ranger Station, 21-Jun-35, S.E.Crumb, 3,(OSUO); Signal Peak Ranger Station, 21-Jun-35, J.Wilcox, 12,(OSUO);

Panscopus (Nocheles) rugicollis Buchanan
(Map 18, Figs. 26, 52)

Panscopus (Nomidus) rugicollis Buchanan 1927:31. Schenkling and Marshall 1931: 41. Buchanan 1936:15. Blackwelder 1939:66.

Panscopus rugicollis. Hatch 1971:290. O'Brien and Wibmer 1982:63.

Panscopus remotus Van Dyke 1949-55. O'Brien and Wibmer 1982:63. **new synonymy**

Type material.— *P. rugicollis* Buch.: Holotype ♀ (USNM No. 28915) Mt. Adams, Washington 6000' July 3 1925 M. C. Lane, Coll. I also examined the

type of *P. remotus* Van Dyke: Holotype ♀ "Taquitz Valley/San Jacinto Mts/ Calif. VI-14 1939; E. S. Ross/ Collector; lupine.roots" (CASC).

Notes about synonymy .— Van Dyke's holotype of *P. remotus* is a dark specimen of *P. rugicollis*. Otherwise it fits the description of *P rugicollis* . Two other specimens, both female: "Lassen Nat'l/ Park Cal./ VI-12-31; Kelly's Ranch; Van Dyke/ Collection" (CASC), and "Norval Flats/ Lassen Co Cal./ 7-12-20/ 5500 ft; J.O.Martin/ Collector" (CASC), initially identified as *P. remotus* , are also merely darker coloured individuals of *P. rugicollis* .

Derivation of specific epithet .— The specific name *rugicollis* was likely derived from the Latin words *ruga* , meaning wrinkle, or crease and *collum* , neck, or *collaris* , pertaining to the neck, and was probably applied to this species in reference to the pronounced rugosities of the prothorax which Buchanan (1927) mentioned in his brief description.

Diagnosis .— This species shares with *P. abruptus* a median carina on the prementum. This character distinguishs these two species from all other species of *Panscopus* . *P rugicollis* has the even elytral intervals setose their entire length, whereas specimens of *P. abruptus* are without setae on the even intervals. In addition, specimens of *P abruptus* are very dark brown in colour, whereas *P. rugicollis* specimens are not as dark, on average.

Description .— Size : ♀♀ (♂♂ unknown) : Length 7.4-9.0 mm (mean=8.3, n=10), width across elytra 2.9-3.4 mm (mean=3.0, n=10); (additional measurements, Table 27). Colour : dark brown. Head : broad transverse depression at base of frons evident but not pronounced, frons and rostrum nearly continuous in lateral view; rostrum without carinae visible through vestiture, in most specimens; some specimens with very thin median longitudinal carina faintly visible through scales; nasal plate indistinct, some scales inserted in area of nasal plate; nasal carina broadly U-shaped in most specimens; vestiture of frons and rostrum of dense, overlapping, striate scales, and scattered, decumbent, broad, flattened setae. Mouthparts: prementum with median longitudinal carina in apical half. Antennae: scape short, extended to only anterior margin of eye; integument concealed by vestiture over most of its length; funicular annuli each with dark brown long primary setae apically directed, and short fine lighter-coloured appressed secondary setae, integument clearly visible through vestiture. Pronotum : broadly rounded laterally, approximately one-fifth wider than long; dorsal surface coarsely rugose; longitudinal sulcus evident, slightly more pronounced in anterior half; vestiture of dense striate scales and scattered decumbent setae. Elytra: broadly oval in females, combined width approximately two-thirds of length, approximately 40% wider than pronotum; declivity in lateral view, rounded, apex of elytron straight, slightly reflexed ventrally; alternate intervals slightly elevated, with partly double row of coarse, blunt setae, even intervals with single row of setae; serial punctures each with round scale larger than surrounding scales; elsewhere vestiture of dense overlapping scales. Legs: tibiae 1, 2 and 3 with few stout, dark brown spines on ventral margin, in distal half, tibia 3 curved, corbellar area narrowly and indistinctly closed. Abdomen : with vestiture of scales and scattered setae; sternum 1 convex at middle in females. Genitalia : ♀♀ : (Figs. 26, 52) sternum 8 with apical expansion

approximately one-third of length; coxites narrowed angularly toward apex in dorsal view, rounded apically in lateral view, stylus with 2 or 3 setae at apex; bursa copulatrix with pair of curved sclerites anteriorly; spermatheca sickle-shaped, broad.

Life History Data .— Of 550 specimens for which I saw dates on labels, 255 were collected in the month of July, 247 in June, 35 in August, 13 in May, 4 in April and 1 in each of March and September.

Host plant associations .— The type specimen of *P. remotus* was reported by Van Dyke (1949) to have been collected from the roots of lupines.

Geographical distribution .— Weevils of this species are known to occur in montane forest habitats in the Pacific region from southern California to central British Columbia (Map 18). Altitude records from label data range from 500 to 3,050 metres. The lowest figure is from the northern end of the geographical range in central British Columbia. These weevils are found at higher elevations in the southern portions of the geographical range of the species.

Phylogenetic relationships .— *P. rugicollis* is the postulated adelphotaxon of *P. abruptus* .

Chorological affinities .— See this topic for *P. abruptus,* above (Maps 17 and 18).

Material examined .— In addition to the type material indicated above, approximately 560 specimens were examined:
CANADA:
British Columbia: Endako, 20-Jul-27, R. Hopping, 1,(CASC); Hope Mtns., 3-Aug-32, A. N. Cartrell, 1,(CNCI); Quesnel 500 m, 18.VII-13.VIII. , S & J Peck, pine-aspen forest, 1,(RSAN).
UNITED STATES OF AMERICA:
California: Eldorado Col: Echo Lake, 21&22-Jul-41, A. T. McClay, 5,(UCDC); Snowline Camp, 27-Jun-48, C. D. MacNeill, 1,(UCDC); Fresno Co.: Huntington Lake, 25-Jul-40, A. T. McClay, 7,(UCDC); Lassen Co., Facht, 11-Jun-22, J. O. Martin, 1,(CASC); Norval Flats, 10-Jun-20, ?, 1,(CASC); Norval Flats, 1680 m, 12-Jun-20, J. O. Martin, 1,(CASC): Lassen National Park, Kelly's Ranch, 12-Jun-31, Van Dyke coll'n, 1,(CASC); Riverside Co.: Taquitz Valley, San Jacinto Mtns., 14-Jun-39, E. S. Ross, lupine roots, 1,(CASC); Shasta Co., Bridge Camp, 1-Jun-46, A. T. McClay, 8,(UCDC); Sierra Co.: Siskiyou Co.: Macdoel, 9.6 km S., 31-Mar-62, Joe Schuh, pine duff, 1,(CWOB); McBride Spring, 6.4 km. NE Mt. Shasta, 4-Jul-63, V. B. Whitehead, 1,(OSUC); McCloud, 25-Jun-14, Van Dyke coll'n, 2,(CASC); Mt. Shasta, 16-Jul-38, 1-Jul-40, 11-Jun-41, 30-Jun-41, A. T. McClay, 82,(UCDC); Mt. Shasta, 6.4 km NE McBride Spring, 4-Jul-63, V. B. Whitehead, 1,(CWOB); Mt. Shasta, Panther Meadow, 2350 m, 1-Aug-82, R. L. Westcott, 1,(RSAN); Trinity Co.: Mtn. Mdw. Rch. head Coffee Creek, 8-10-Jul-1969, W. G. Goodman, ,1,(UCDC); "Calif.", ?, ?, *Bufo*, 1,(USNM); Idaho: Adams Co.: Bear, 2-Jul-68, B.F. & J.L. Carr, 2,(JLCC); Valley Co.: McCall, 10-Jun-33, F. H. Shirk, 2,(OSUO); McCall, Brundage Mtn. 1830 m, 24-Jun-38, M. C. Lane, 2,(OSUO); Petit L, 10-Jul-68, B.F. & J.L. Carr, 1,(JLCC): Oregon: Baker Co.: Baker, Pine Creek" 22-Mar-42, K.M.&D.M. Fender, 1,(OSUO); Sumpter, 15&17-Jun-84, B.F. & J.L. Carr, 2,(JLCC); Clackamas Co.: Government Camp, 5 km N., 26-Jul-61, D. R. Smith, ex.: lupine, 1,(OSUO); Mt. Hood, government Camp, 1.6

km S., 25-29-Jul-66, ?, *Vaccinium*, at night, 1,(CWOB); Deschutes Co.: Indian Ford C., 17-Jun-70, R. Turnbow, 1,(CWOB); Bend, 11.3 km S., 29-Jul-58, Gerald F. Kraft, 1,(UICM); Douglas Co.: Diamond Lake, 29-Jun-41, K.M.&D.M. Fender, 2,(OSUO); Diamond Lake, 15-Jul-27, E. H. Nast, 1,(CASC); Harney Co.: Steen Mtns., 25-Jun-22, Van Dyke coll'n, 1,(CASC);Steens 2440-3050 m, 14-16-Jul-53, Roth & Beer, 1,(OSUO); Hood River Co.: Cloud Cap Inn, 6.4 km E., 26-Jul-61, D. R. Smith, 1,(OSUO); Cloud Cap Road, Mt. Hood, 1370 m, 17-Jul-33, S. E. Crumb, 1,(OSUO); Mt. Hood 1530-1830 m, 1-Jul-27, E. C. Van Dyke, 10,(CASC); Mt. Hood, 1520m, 21-Jun-25, M. C. Lane, 2,(USNM); Mt. Hood. Homestead Inn, 1-Jul-27, E. C. Van Dyke, 5,(CASC); Jackson Co., Union Creek, 6-Jul-41, A. T. McClay, 19,(UCDC); Klamath Co., Crater Lake, 21-Aug-48, M. H. Hatch, 1,(OSUO)Crater Lake, 16-Aug-34, Jack Bongberg, 2,(UCDC); USA, OR, Klamath Co., Crater Lake, 6-Jul-41, A. T. McClay, 1,(UCDC); Ft. Klamath, ?, ?, *Bufo boreas*, 1,(USNM); Mt. Pitt Trail, 14-Jun-61, Joe Schuh, *Abies concolor*, 1,(AMNH); Upper Klamath Lake, 28-Jun-17, R. Hopping, 1,(CASC); Lake Co., La Pine, 24 miE., 12-Aug-68, Gerald F. Kraft, 1,(UICM); Lakeview, Crane Mt. Trail, 26-Jun-84, B.F. & J.L. Carr, 2,(JLCC); Lakeview, Willow Creek Camp, 27-Jun-84, B.F. & J.L. Carr, 1,(JLCC); Warner Mts., 20-Jun-22, Van Dyke coll'n, 32,(CASC); Lane Co., Frog Camp Cpgd., N. E. Corner", 2-Aug-66, W. Gagne, Ex.: *Vaccinium*, 4,(CWOB); Olalie Creek, 13 km. N. Belknap Springs, 3-Jun-47, B.Malkin&I.M.Newell, 1,(FMNH); Siskiyou Co.: McCloud, 4 mi. E, Fowler's Camp, 2-Jul-63, V. B. Whitehead, 1,(CWOB); Umatilla Co.: Lehman Springs, hwy 244" 14-Jun-84, B.F. & J.L. Carr, 1,(JLCC); Toll Gate Road, Blue Mtns., 11-Jun-38, Van Dyke coll'n, 5,(CASC); Tollgate Road, Blue Mts., 21-Jun-41, K.M.&D.M. Fender, 1,(OSUO); Union Co., , Sept. 1974, Dwight Schuh, 1,(AMNH); Wallowa Co.: Wallowa L.1370 m, 15-Jun-38, M. C. Lane, 1,(OSUO); Wallowa Lk., 22&23-Jun-41, K. M. Fender, 2,(OSUO); Whitman Nat'l For., Anthony Lakes, 9-Jul-41, M. C. Lane, 1,(OSUO);unknown counties: Swim, 2-Jul-42, Schuh & Gray, 1,(AMNH); Washington: Grays Harbor Co.: Montesano, 8-May-32, J. Wilcox, 1,(UCDC); Kittitas Co., Easton, 10-Jun-38, M. C. Lane, 5,(OSUO); Easton, 18-Apr-31, W. W. Baker, 2,(USNM); Okanagan Co.: Lone Fir Cpgd. 16 km W. Mazama, 19-Jun-87, T. G. Spanton, 1,(TGSC); Lone Fir Cpgd., 16 km W. of Mazama, 20-Jun-87, T. G. Spanton, *Amelanchier alnifolia* , at night, 7,(TGSC); Pierce Co.: Mt. Rainier N. P., Sunrise 1950 m, 11-Jul-61, E. C. Becker, 1,(CNCI); Mt. Rainier Nat. Park., Sunrise, 13-Aug-31, ?, 7,(WSUC); Mt. Rainier Natl. Pk., Sunrise 1940 m, 13-Aug-31, J.Wilcox, 3,(CUIC), 5,(CASC); Mt. Rainier Natl. Pk., Sunrise 1940 m, 14-Aug-31, W. W. Baker, 1,(CASC); Mt. Rainier Natl. Pk., Sunrise 1940 m, 28-Jul-32, S. E. Crumb, 1,(CASC); Mt. Rainier Natl. Pk., Sunrise Peak, 24-Jul-36, Van Dyke coll'n, 50,(CASC); Mt. Rainier, Sunrise", 14-Aug-31, W. W. Baker, 1,(CNCI), 4,(USNM); Mt. Rainier, Sunrise 1925 m, 23-Jul-32, J. Wilcox, 3,(AMNH); Mt. Rainier, Sunrise 1950 m, 6-Aug-35, 25-Jul-36, W.W. Baker, 3,(OSUO); Mt. Rainier, Sunrise 1940 m , 28-Jul-32, S. E. Crumb, 2,(CNCI); Mt. Rainier, Sunrise, 1890. Shallow Lake, ?, A. T. McClay coll'n, 2,(UCDC); Mt. Rainier, Sunrise,1925 m, 23-Jul-32, J. Wilcox, 1,(CNCI), 1,(DEUN);Mt. Rainier, Sunrise, 1940 m, 14-Aug-31, W. W. Baker, 2,(UCDC); Mt. Rainier, Sunrise, 1950 m, 5-Aug-35, W. W. Baker, 2,(UCDC); Mt. Rainier. Sunrise, 1925 m. , 23-Jul-32, J. Wilcox, 26,(OSUO); Mt. Rainier. Sunrise, 1925 m, 28-Jul-32, S. E. Crumb, 6,(OSUO); Mt. Rainier Natl. Park, 14-Jul-45, ?, 2,(USNM); Mt. Rainier Nat'l. for.,

Hell's Crossing, 30-May-35, J. Wilcox, 12,(OSUO); Rainier Nat'l Park, Tipsco Lk. 1640 m, 20-Jul-66, W. Gagne, *Solidago ciliosa* , night 37°F, 1,(BMNH), 46,(CWOB), 1,(OSUC), 1,(RHTC), 2,(RSAN); Yakima Co.: Bird Creek, Mt. Adams, 1220-1830 m, 24-Jul-21, M. C. Lane, 1,(USNM); Mt. Adams, 3-Jul-31, F. H. Shirk, 3,(OSUO); Mt. Adams, Bird Creek, 31-Jul, I. W. Bales, 4,(WSUC); Mt. Adams, Bird Creek 1520 m, 18-Jul-33, K. E. Gibson, 1,(OSUO); Yakima Indian Forest Preserve, 1-Jul-25, Van Dyke coll'n, 1,(CASC); unknown counties: Signal Peak, 21-Jun-35, S. E. Crumb, 3,(OSUO); Signal Peak, 21-Jun-35, J. Wilcox, 2,(OSUO); Signal Peak Ranger Station, 15-Jul-33, J. Wilcox, 20,(OSUO); western Washington, ?, Paul Eide, 1,(WSUC).

6. EVOLUTIONARY ANALYSIS- RECONSTRUCTED PHYLOGENY

Methods of phylogenetic reconstruction

Phylogenetic analysis was carried out using the principles outlined by Hennig (1966), Ross (1974), and Wiley (1980) and others, in that relatively recent common ancestry between or among taxa is inferred when states of characters deemed to be derived, or apotypic, are shared by those taxa. Characters are polarized, that is the states hypothesized to be apotypic versus plesiotypic by outgroup comparison as outlined by Ross (1974), Wiley (1981), Watrous and Wheeler (1981) and Maddison, Donoghue and Maddison (1984). This requires that the sister group of the "ingroup" at a given level of analysis, be recognized. The Ophryastini were deemed to be the sister group of the Leptopiini, for reasons discussed below. For the analysis of the species of *Panscopus* , this was not so clear-cut, and a generalized outgroup approach (Ball, 1985) was used. In this study it involved examination of representatives of a number of genera of Leptopiini to gain insight into which states of characters were widespread among the genera, and which could be hypothesized to be apotypic within *Panscopus* .

Initial analysis of character distributions was carried out in two stages. As character state distributions were tabulated, hypotheses were formed concerning small lineages within the overall group, at each level of analysis. It became apparent that, because of the large number of taxa and the large amount of seemingly conflicting character information, very little resolution of relationships among taxa would be possible without the use of computer algorithms designed for the purpose. The next stage of analyses involved the use of version 3.0 of "Phylogenetic Analysis Using Parsimony" (Swofford, 1990)(subsequently referred to as PAUP), using an Apple Macintosh™ computer, to arrive at maximally parsimonious trees for each data set. Subsequently, a second stage of analysis was carried out, very greatly accelerated by the computer program MacClade (version 2.1, Maddison and Maddison, 1987) on an Apple Macintosh™ computer. Use of MacClade enables a systematist to trace character changes and investigate alternate tree topologies much more quickly than is possible with pencil and paper. This latter phase of analysis was carried out to compare locally different tree topologies supported by especially convincing characters, such as certain states of genitalic structures, which did not occur elsewhere, among outgroups. Such tree topologies were selected, where possible, over others arrived at by strict parsimony methods, but supported by less convincing characters showing homoplasy in the ingroup and/or among outgroup taxa. Characters which do not exhibit homoplasy are subseqently referred to as primary characters, and those which do exhibit homoplasy are considered secondary characters.

Relationships among tribes of Entiminae

The monophyly of most entimine tribal groups has not been well established, and relationships among the tribes remain unclear. A few authors have expressed opinions regarding relationships among these taxa. As noted above, Vaurie (1951) expressed the opinion that the Promecopini and the Entimini are very closely related groups. Kuschel (1956: 169) believed that the

Premnotrypini were the most primitive group among the Leptopiinae (=Entiminae), even though they are distributed geographically in the cordilleran region of the Andes between Colombia and Bolivia and the extreme north of Chile, at altitudes above 3,000 metres. The Andes having been a relatively recent orogeny (late Tertiary), it seems unlikely that such a recent, high elevation habitat would be occupied by the most primitive tribe of the subfamily. Kuschel believed that the Premnotrypini were derived from a common ancestry with a semiaquatic group such as the Cylydrorhininae or Erirhininae. Kuschel (1956) stated that a systematic treatment of the Leptopiinae (=Entiminae) should begin with the Premnotrypini as the most basal lineage, and the Strangaliodini (= Leptopiini of authors) (such as the genera *Parergus* Kuschel and *Malvinius* Kuschel) as the most derived group.

Thompson (1988) implied an adelphotaxon relationship between the Ophryastini of the North American continent and the Leptostethini of the southern part of Africa. He pointed out that representatives of these groups live in dry, open habitats, exhibit a head markedly deflexible so that when fully deflexed, the lower part of the eye is covered by the post-ocular lobe, markedly decurrent scrobes with distinctly delineated dorsal rim, and free claws. The distinctly delineated, markedly decurrent scrobes may be a synapotypy, but the other characters are not demonstrably apotypic within the subfamily, and thus they provide little support for a common ancestry of these tribes.

With the caveat that much additional research is needed to put the classification of the subfamily Entiminae on a phylogenetic basis, and that the monophyly of each of the tribes is yet to be demonstrated by modern phylogenetic methods, representatives of each of the above tribal groups were examined. Partly for heuristic reasons, to gain some preliminary insight into relationships among these taxa, and partly to determine the best choice of outgroup for an analysis of genera of the tribe Leptopiini, I carried out a cladistic study of relationships among the tribes of Entiminae. An attempt was made to examine representatives of the type genus (and if possible the type species of that genus) of each tribe. A systematic survey of all entimine taxa to determine the monophyly of the tribal groupings, and study of other broad-nosed weevil taxa to determine the nearest out-group for the Entiminae were beyond the scope of this study. A generalized outgroup approach was applied for character polarization, using diverse representatives of the Polydrosinae, or non-entimine, broad nosed weevils.

I have used my general knowledge of the North and Central American members of this tribe Leptopiini to establish the character states representative of the tribe for analysis. As I continue to study Leptopiini of other parts of the world, I doubtlessly will revise my definition of the tribe, and relationships among genera of this tribe.

Character data was analyzed with version 3 of PAUP (Swofford, 1990), using an exhaustive search option, at first with all characters unordered, and subsequently with all but two characters ordered (chars. 27 and 28 remained unordered). The exhaustive search option is an exact method which analyses and calculates the tree length in number of character steps, of all possible tree topologies, or branching patterns, for the given data set. Because the outgroup is not defined precisely, and the monophyly of the tribes thus analyzed is, in

some instances, questionable, the assumptions about character state polarity are less than sound. However, the resulting hypothesized phylogeny is presented to choose an outgroup for analysis at a lower level, and for further testing with future systematic study of the taxa of the subfamily Entiminae.

Analysis of character states – Characters are listed numerically, in the sequence in which they appear in the character matrix (Table 28) and in the cladogram (Fig. 77).

1. Postocular lobes. 0, absent; 1, present.
2. Elytral sculpture. 0, evident striae, no pits; 1, striae with rows of setose pits; 2, serial pits each with elongate scale; 3, each pit with round scale.
3. Elytral intervals. 0, flat, not elevated; 1, equally convex; 2, alternate intervals elevated or carinate.
4. Pronotal topography. 0, smooth or slightly irregular; 1, rugose-tuberculate.
5. Pronotum, median longitudinal sulcus. 0, none; 1, partial; 2, complete.
6. Elytra, lateral margin. 0, emarginate at proepisternum; 1, smoothly curved.
7. Scape vestiture. 0, setae only; 1, with setae and scales.
8. Rostral carina. 0, absent; 1, one or more carina(e).
9. Frons, width. 0, narrower than rostrum; 1, wider than rostrum.
10. Rostrum. dorsal transverse impression. 0, absent; 1, present, slight or pronounced.
11. Elytral humeri. 0, prominent; 1, rounded.
12. elytral suture. 0, free; 1, fused on midline.
13. Metathoracic wings. 0, macropterous; 1, brachypterous; 2, apterous.
14. Pronotal length/width ratio. 0, longer than wide; 1, equivocal; 2, wider than long.
15. antennal funiculus. 0, setae only; 1, scales and setae.
16. Tarsal vestiture. 0, setae only; 1, setae and scales.
17. Scrobes, dorsal margin. 0: distinct; 1, indistinct.
18. Scape direction. 0, below eye; 1, over lower quarter of eye; 2, over middle of eye.
19. Tibia 3. Corbellar area. 0, with scales; 1, glabrous.
20. Female genitalia. Tergum 8. 0, conical and rounded, or broadly angular; 1, laterally compressed and acute.
21. Female genitalia. spiculum ventrale. 0, broad and angular or rounded apically; 1, laterally compressed, stiletto shaped.
22. Female coxites. 0, nearly cylindrical; 1, laterally compressed.
23. Scape length. 0, not extended to anterior margin of eye; 1, extended to, but not beyond, eye; 2, beyond eye, but not to anterior margin of pronotum; 3, extended beyond anterior of pronotum.
24. Mentum. number of setae. 0, 4 pairs or more; 1, 3 pair of setae; 2, 2 pair or fewer setae.

25. Suture between abdominal sternites 1 and 2. 0, sinuous; 1, straight.
26. Elytral striae 9 and 10. 0, separate, the length of elytron; 1, meet adjacent to coxa 3.
27. Prementum shape. 0, quadrate.; 1, diamond-shaped; 2, triangular; 3, angled anteriorly, rounded posteriorly; 4: nearly round.
28. Nasal plate of rostrum. 0, indistinct; 1, V-shaped carina; 2, U-shaped carina.
29. Metepisternal suture. 0, obvious; 1, partially obliterated; 2, obliterated.

Reconstructed phylogeny — Both the analysis with all characters unordered and the analysis with all but two of the characters ordered produced one shortest possible tree, with identical tree topology (Fig. 77). The monophyly of the subfamily is supported by the presence of distinct postocular lobes laterally on the anterior margin of the prothorax (char. 1). In this reconstruction apotypies supporting terminal taxa are omitted except to explain the distribution of characters and states included in the analysis for other reasons. The next lineage (Promecopini + (Entimini + (Ophryastini + Leptostethini) + (Leptopiini + Premnotrypini))), is supported by the apotypic presence of rows of setose or squamose pits on the elytral intervals (character 2) and by apotypic convex elytral intervals (character 3). The latter character (no. 3) undergoes reversal to the plesiotypic condition in *Leptostethus* . After the dicotomy separating the Promecopini from the rest of the subfamily, the common ancestry of the lineage (Entimini + ((Ophryastini + Leptostethini) + (Leptopiini + Premnotrypini))) is supported by the apotypic rugose tuberculate topography of the pronotum (char. 4) in most or all of the representatives examined for each taxon, the presence of a partial or complete median longitudinal sulcus on the pronotum (char. 5), and the smoothly curved lateral elytral margin (char. 6) in contrast to the emarginate shape opposite the anterior end of the metepisternum exhibited in the plesiotypic condition. All three of these characters, however, are homoplastic within the subfamily Entiminae and among the polydrosine broad-nosed weevils.

The hypothesized common ancestry of the taxa (Ophryastini + Leptostethini) + (Leptopiini + Premnotrypini) is supported by a number of characters. Specimens examined representing these four taxa have both setae and scales on the scape (char. 7), one or more carina(e) on the dorsal surface of the rostrum (char. 8), the frons wider than the width of the rostrum (char. 9), and the frons and rostrum separated by a transverse depression ,dorsally at the base of the rostrum (char. 10). Representatives of these four tribes also exhibit a suite of character states related to reduction of wing size and loss of flight. These are: rounded elytral humeri, in contrast to the plesiotypic elytral humeri prominent and quadrate or acutely angular (char. 11); elytra fused together along the midline suture (char. 12); and metathoracic wings reduced (most species in these tribes), or are lost (*Leptostethus* spp.) (char. 13). Representatives of these four tribes also have the pronotum wider than long, but this character state occurs also in the Promecopini (char. 14).

The adelphotaxon relationship between Ophryastini and Leptostethini is supported primarily by the the presence of a vestiture of setae and scales on the antennal funiculus (char. 15), and secondarily by a tarsal vestiture of setae and

scales (char. 16). This supports the suggestion of Thompson (1988) that the North American group Ophryastini and the South African group Leptostethini may have a close common ancestry.

The adelphotaxon relationship between Leptopiini and Premnotrypini is supported by a suite of characters including the dorsal margin of the scrobes not well defined (char. 17), scape directed over the eye rather than below it (char. 18), and the corbellar area of tibia 3 glabrous (char. 19). Also a suite of characters is involved in the lateral compression of the female genitalic armature, including tergum 8, spiculum ventrale and the coxites (chars. 20, 21, 22) all being markedly compressed laterally, giving the entire female armature a stiletto-like shape, apically. These characters (chars. 17-22), however, are all polymorphic within the Leptopiini. The lateral compression of the female genitalic armature is, among the entimines, a convincing apotypic state. Only some of the Leptopiini exhibit this state, however, and the fact that *Premnotrypes vorax* also exhibits this state suggests that the genus *Premnotrypes* may be closely related to species of the genera *Amphidees, Tropiphorus,* and some species of *Lepesoma* among the Leptopiini. These observations call into question the monophyly of the Leptopiini and the Premnotrypini at the tribal level. Clearly, much additional study of these groups is required to place the tribal level classification on a phylogenetic footing.

A number of character states are shared between the Ophryastini and the Leptopiini (Fig. 77). The number of setae on the prementum (char. 24) is, in the plesiotypic condition, 4 or more on each half of the ventral surface of the prementum. This number is apotypically reduced in *Ophryastes* species to three pair or fewer, and in the Leptopiini is also reduced to 3 pair, 2 pair,or fewer, with some representatives having no setae on the prementum. The Ophryastini and the Leptopiini both have representatives with an apotypically straight suture between abdominal sterna 1 and 2 (char. 25). Representatives of Ophryastini and Leptopiini exhibit an apotypic condition in which elytral striae 9 and 10 converge opposite coxa 3 (char. 26). In representatives of other taxa of entimines which I have examined, striae 9 and 10 remain separate the length of the elytron.

To further confuse relationships among the tribes Ophryastini, Leptostethini, Leptopiini and Premnotrypini, some representatives of the Leptopiini share with *Ophryastes* and *Leptostethus* an apotypic state of the vestiture of the dorsal surface of the tarsi, comprised of setae and flat scales.

Because. Premnotrypes shares convincing apotypies of the female genitalia with some genera of the Leptopiini, it calls into question the monophyly, and validity of recognizing the Leptopiini and Premnotrypini as distinct tribes. For purposes of comparisons among genera traditionally classified in the Leptopiini and occurring in North and Central America I used the Ophryastini as the outgroup. The Ophryastini are a demonstrably monophyletic group based on an apotypic proventricular structure (Kissinger 1970) and are sufficiently closely related to the Leptopiini to make a good outgroup for character polarization for phylogenetic inference among genera of the Leptopiini.

Monophyly of the Leptopiini

The higher classification of the Curculionidae is in a state of flux. Guillermo Kuschel is preparing a new classification of the family-group taxa of the Curculionoidea. Various revisions of his tentative classification have been distributed, but to date nothing of the new scheme has been published. The most recent published classification of subfamily and tribal groups including and related to the Leptopiini are checklists O'Brien and Wibmer (1982) and Wibmer and O'Brien (1986).

Monophyly of the Leptopiini is questionable. *Premnotrypes* shares convincing apotypies of the female genitalic armature with a complex of genera classified within the Leptopiini. The tribe Leptopiini is comprised of approximately 615 species representing 88 genera collectively distributed over the globe (O'Brien and Wibmer 1982, Wibmer and O'Brien 1986, Schenkling and Marshall 1931). The Premnotrypini comprises 28 described species representing three genera in the Neotropical region (Wibmer and O'Brien 1986). Given that the Premnotrypini are doubtfully distinct from the Leptopiini at the tribal level, much systematic research is required to investigate relationships among these genera and establish a suprageneric classification on a phylogenetic basis. It is expected that such investigations will bring about a redefinition of some of the genera, as well. For the present study, the tribe Leptopiini is defined as a collection of genera as indicated in O'Brien and Wibmer (1982).

Relationships among genera of Leptopiini

Comparison of the 27 surveyed genera of Leptopiini revealed few convincing apotypies to infer relationship among groups. Many characters surveyed implied conflicting hypotheses of relationship. Partly because of rampant homoplasy, and because there are approximately 1.6×10^{35} distinct, rooted, binary trees for 28 taxa (including the outgroup), mental analysis was impossible and using exact methods of parsimony analysis with computer programs was not feasible. An early attempt to analyze a character set for 28 taxa on an Apple Macintosh™ SE computer, left a branch and bound analysis with version 3.0q of PAUP (Swofford 1990) running for five days. Based on the indicated fraction of the analysis completed in that time, a rough extrapolation of the time required to run the analysis to completion was 16 months. For this reason so-called "heuristic" search methods were selected in version 3.0q of PAUP. Swofford (1990) indicated that heuristic methods which make use of "stepwise addition" and "branch swapping" can be very effective search strategies. Stepwise addition adds each taxon, one at a time, to the analysis until a compete tree is developed. In a random addition sequence a random number generator is used to obtain a permutation of the taxa, so that the initial tree analyzed is different in each replication of the search technique. In each replication branch swapping is then performed by the computer and software, to search for better trees. As Swofford (1990) indicates, if 100 such replications are performed and the same set of equally short trees are found in most or all of these replications, and none of the replications find any shorter trees, the set very probably includes all of the optimal trees. In this analysis, ten sets of ten such replications were carried out with a random addition sequence, the TBR branch swapping in effect, MULPARS option in effect, and branches of length

zero were collapsed to produce polytomies. The same set of 26 optimal trees were consistently found. The hypothesized phylogenetic relationships presented in the cladogram in Figure (78) represents a strict consensus of the optimal trees.

Analysis of character states– Characters are listed numerically, in the same sequence in which they appear in the character matrix (Table 29) and in the cladogram (Fig. 78). Most characters were ordered, with state zero interpreted as the plesiotypic state and states one, two, and so on, apotypic. Characters two and 16 were unordered, and character 8 was treated as ordered, but the plesiotypic state was one, with states zero and two interpreted as apotypic.

1. Rostrum, dorsal transverse impression. The state of the transverse depression separating the rostrum from the frons is coded as one of the following. 0, pronounced transverse depression; 1, slight discontinuity; 2, frons and rostrum continuous.
2. Pronotal topography. 0, smooth; 1, punctures or slight irregularity; 2, roundly tuberculate; 3, rugose-tuberculate.
3. Sterna 2, length relative to sterna 3 and 4. 0, sternum 2 shorter than 3+4 measured along midline; 1, sternum 2 longer than combined length of 3+4; 2, sternum 2 longer than twice the combined length of sterna 3+4.
4. Suture separating sterna 1 and 2. 0, straight at midline; 1 slightly sinuous a t middle.
5. Mandibular scar. 0 not elevated; 1 elevated; 2 elevated and laterally compressed.
6. Prosternum - posterior ventral thin transverse sulcus. 0, present; 1, absent.
7. Metacoxae, distance between. 0, closer than the width of one coxa; 1, separated by a distance greater than the width of one coxa.
8. Tarsal segment 3 - condition of ventral brush of setae. 0, dense brush of setae; 1, two separate pads of setae, distally, one on each lobe of tarsus 3; 2, absent, coarse setae only, on ventral surface of third tarsal segment.
9. Elytral intervals. 0, all intervals flat or equally convex; 1, alternate intervals elevated or carinate.
10. Tibia 3. 0, straight; 1, curved ventrally.
11. Metepisternal suture. 0, obvious, complete; 1, partially obliterated; 2, obliterated.
12. Tibia 3, corbellar area at apex. 0: open; 1, closed, with enclosed area glabrous; 2, closed, enclosed areawith scales or coarse setae.
13. Elytra, basal margin. 0, elytral surface meeting prothoracic sclerites in smooth curve; 1, abruptly cliffed at anterior margin.
14. Rostrum, median carina. 0, present; 1, absent.
15. Scape direction. 0, directed below eye; 1, passing over the lower quarter off eye, when resting next to head; 2, over middle of eye.
16. Pronotum, dorsal longitudinal sulcus or carina. 0, carina; 1: none; 2, sulcus anteriorly, incomplete; 3, sulcus complete.

17. Prementum, number of setae. 0, four pair or more; 1, three pair; 2, two pair; 3, one pair; 4, glabrous.
18. Elytral scales. 0, overlapping scales; 1, non-overlapping scales; 2, no scales.
19. Antennal funiculus, vestiture. 0, scales and setae; 1, setae only.
20. Scape length. 0, not extended to anterior margin of eye; 1, extended to eye, but not beyond; 2, extending beyond posterior margin of eye.
21. Pronotum, ratio of length to width, in dorsal view. 0, wider than long; 1, approximately as long as wide; 2, longer than wide.
22. Elytral pits. 0, rows of pits, each pit with a fine seta; 1, pits each with an elongate scale; 2, pits each with a broad oval or round scale.
23. Mandibular scar, relative size. 0, normal, easily visible; 1, greatly reduced, to nearly absent.
24. Scape vestiture. 0, setae and scales; 1, setae only.
25. Tarsi, vestiture on dorsal and lateral surfaces. 0, scales and setae; 1, setae only.
26. Scrobes, ventral margin. 0, well defined; 1, indistinct.
27. Rostrum, dorsal longitudinal carina. 0, absent; 1, one medial carina; 2, tricarinate.
28. Rostrum, lateral longitudinal sulcus. 0, present; 1, absent.
29. Postocular lobes. 0, prominent; 1, reduced.
30. Postocular vibrissae. 0, short; 1, long.
31. Scrobes, dorsal margin. 0, distinct; 1, indistinct.
32. Tarsal segment 3. 0, wide and bilobed; 1, narrow.
33. Scutellum. 0: large, visible; 1, minutely visible; 2, not visible.
34 Elytral striae. 0, rows of pits, each with thin seta; 1, evident striae, pits indistinct; 2, striae indistinct.
35. Prementum, size. 0, normal; 1, reduced.
36. Elytral setae. 0, rows of setae; 1, no setae.
37. Prosternal projection between and posterior to procoxae. 0, absent; 1, pit; 2, rounded bulb; 3, acute projection.
38. Antennal club. 0, broad, club-like; 1, elongate, narrow.
39. Tarsal claws. 0, free; 1, connate.
40. Tibia 3, spines on ventral edge, apically. 0, absent, or not distinguishable from surrounding setae; 1: stout, socketed spines visible.
41. Female genitalia, tergum 8. 0, conical and broadly rounded apically; 1, laterally compressed and acute apically.
42. Female genitalia, spiculum ventrale. 0, broad and spade-shaped apically; 1, sharply compressed laterally, acute apically.
43. Female genitalia, coxites. 0, nearly cylindrical or broadly angular dorsally, rounded apically in lateral view; 1, laterally compressed, narrow.

Reconstructed phylogeny- comments on evident clades, and unresolved portions of the reconstruction.– The reconstructed phylogeny is presented in Figure 78. This cladogram is a strict consensus of 26 equally most parsimonious trees.

The character numbers illustrated in Figure 78 correspond to those of the above list and to those in Table 29. In Figure 78 apotypic states of characters with more than two states are designated with a superscript. For example, in character 1, the first apotypic condition (state 1) is indicated 1′ and the second apotypic condition (state 2) is indicated 1′′. Characters of terminal taxa are omitted, except for characters which were of inferential use elsewhere in the phylogenetic reconstruction. This phylogenetic reconstruction is a preliminary working hypothesis for the purposes of: (1), identifying outgroups for the phylogenetic analysis of species of the genus *Panscopus* ; (2), identifying genera or clades of genera most needing future systematic study; and (3), to present a preliminary framework of hypotheses of relationship against which future study of taxa of the Leptopiini of other geographical regions can be compared or amalgamated.

The group analyzed is not holophyletic, in that I have limited the study to only those genera occurring in North and Central America. However, despite the artificiality of studying a subset of the genera classified in the tribe Leptopiini, the ingroup taxa are, relative to the outgroup, monophyletic, supported by characters 1, 2, 3, 4, and 12.

The transverse depression at the base of the rostrum (char. 1), separating it from the frons, is pronounced in the plesiotypic condition. This is variously reduced in the ingroup taxa. In the basal lineages (*Miloderes* - *Rhigopsis* at the left hand side of the cladogram) this depression is absent, or nearly so, so that the frons and rostrum appear continuous in profile. There is a slight reversal in *Triglyphulus* within this group. In the large clade including 20 genera from *Paracimbocera* to *Phyxelis* , toward the left side of the cladogram (Fig. 78) this depression is apotypically reduced, but present, although homoplasy is evident. *Paracimbocera* and *Crocidema* independently have undergone reversal to a plesiotypically pronounced transverse depression. In *Dirotognathus* and *Tropiphorus* the depression is apotypically absent, with the frons and rostrum appearing continuous in profile. Within *Amphidees* and *Panscopus* this character is polymorphic with apotypic character states 1 and 2 represented among the taxa. However, in none of the species of these genera is the transverse depression as pronounced as in the plesiotypic state exhibited by the outgroup *Ophryastes* .

For character 2, the plesiotypic condition exhibited by the most of the species in the outgroup *Ophryastes* includes round pits in an otherwise nearly smooth pronotal surface. Character 2 supports the basal branching between *Ophryastes* and all of the examined taxa of Leptopiini in that this plesiotypic state is variably modified in most of the taxa. In the six genera *Plinthodes* to *Rhigopsis* at the left side of the cladogram (Fig. 78) the pronotum is plesiotypically variously rugose-tuberculate (state 3), except in *Miloderes* the pronotal surface is roundly tuberculate (state 2). In the clade of 20 genera from *Cimbocera* to *Paranametis* at the right of the cladogram (Fig. 78), the majority of taxa exhibit a smooth pronotum, but homoplasy is exhibited. *Lepidophorus*,

Crocidema and *Lepesoma* exhibit a plesiotypic arrangement of punctures, as in *Ophryastes* (state 1) but these are not all identical. *Melanolemma* and *Dichoxenus* exhibit a rugose-tuberculate pronotal texture (state 3) and *Leptopinara* and *Anametis* exhibit a roundly tuberculate (state 2) pronotum. *Panscopus* is polymorphic for this character, with some species exhibiting a smooth pronotum (state 1), some roundly tuberculate (state 2),and some rugose-tuberculate (state 3). This character is sufficiently homoplastic and sufficiently variable within taxa as to be very difficult to code, as the various states are not discrete. I place little confidence in the use of this character in phylogenetic inference at this level of analysis.

For character number three, the outgroup exhibits the plesiotypic state in which the length of abdominal sternum 2, measured along its midline, is shorter than the combined length of sterna 3 and 4. In the ingroup taxa this has been modified to an apotypic condition in which sternum 2 is longer than the combined length of sterna 3 and 4, with some exceptions, as follows. In *Rhigopsis,* in *(Dirotognathus + Lepidophorus)* and in *Phyxelis* the elongation of sternum 2 is increased (state 2) to the condition in which sternum 2 is longer than twice the combined length of sterna 3 and 4. This is secondary evidence, at a lower level in this reconstruction, for the adelphotaxon relationship between *Dirotognathus* and *Lepidophorus.* In *Dichoxenus, Amphidees*, and the three-genus clade including *Lepesoma*, *Amphidees* and *Paranametis*, this character has reversed to the plesiotypic condition. This is secondary evidence, at a lower level of analysis, for monophyly of (*Lepesoma* + (*Amphidees* + *Paranametis*).

Character 4, in the plesiotypic state exhibited by the outgroup, is a straight suture between sterna 1 and 2 on the venter of the abdomen. In the 11 genera from *Dirotognathus* to *Rhigopsis* at the left side of the cladogram (Fig. 78) an apotypic condition is exhibited in which the suture in question is sinuous. However, this character is homoplastic within the clade of 16 genera from *Crocidema* to *Paranametis* on the right side of the cladogram (Fig. 78).

Character 12 provides additional secondary support for the in group, but requires numerous reversals and independent evolution of the apotypic state (Fig. 78).

The next dichotomy is supported by seven characters. The genus *Rhigopsis* exhibits secondary (homoplasous) autapotypic states of characters 3, 5, 6, 7, 8, 9, 10, 11, and 13. The common ancestry of the large remaining clade including all of the 26 genera *Adaleres* to *Phyxelis* to the left of *Rhigopsis* in the cladogram (Fig. 78), is supported by secondary apotypic states of characters 14, 15, 16, 17, 18, 19, and 20.

The next branching point is a quadritomy including: (1), *Miloderes* ; (2),*Adaleres* ; (3), the lineage leading to *Trichalophus* ,*Triglyphulus, Plinthodes,* and *Acmaegenius* ; and (4), the ancestor of the 20-genus clade from *Cimbocera* to *Paranametis* to the right of the cladogram (Fig. 78). Monophyly of the clade including the genera *Trichalophus*,*Triglyphulus, Plinthodes,* and *Acmaegenius* is supported by nine characters. A unique apotypic state of character 23, in which the mandibular scar is greatly reduced or virtually absent, is primary support for the monophyly of this clade. This clade is supported secondarily by apotypies of characters 8, 17, 18, 24, and 25, as well as apotypic reversals of

characters 14, 15, and 20. Notable among these are the number of setae on the prementum apotypically reduced to zero (state 4, character 17), and scape vestiture comprised of setae only (state 1, character 24) Three of the four species exhibit no scales, or elongate seta-like scales on the elytral surface (state 2, character 18).

Support for the monophyly of this group of four genera, *Plinthodes, Acmaegenius, Triglyphulus,* and *Trichalophus,* is not surprising. These genera were classified together as a separate tribe (Kissinger 1964). They were placed together by Klima (1935) as the subfamily Alophinae within the phanerognathan weevils, presumably because of the reduced mandibular scar which may not have been noticed by early workers.

The common ancestor of the 20 genus clade from *Cimbocera* to *Paranametis* (Fig. 78).is supported by reversal of character 1, and by apotypic states of the secondary characters 2, 26, 28, and 31.

The adelphotaxon relationship of *Cimbocera* and *Paracimbocera* is supported by the shared apotypic state of the primary character 8, in which tarsal segment 3, is narrow, in contrast to the plesiotypic state exhibited by all of the other studied taxa, in which this segment is wide and bilobed. Associated with this narrowed segment is a reduction in the brush of setae present plesiotypically on its ventral surface. In these genera the ventral setae are reduced to two very small clumps of setae apically (*Paracimbocera*) or to a few coarse setae, ventrally (*Cimbocera*) The common ancestry of these two genera is supported also by apotypies of the secondary characters 17, 33 and 34, as well as by reversals of characters 19 and 20. The adelphotaxon relationship between *Cimbocera* and *Paracimbocera* agrees with Ting (1940), who suggested that these two genera were more closely related to each other than to other related genera such as *Miloderes,* based on characters of the tarsal shape and vestiture mentioned above.

Common ancestry of the clade of genera from *Lepidophorus* to *Paranametis* (Fig. 78), is supported by apotypies of secondary characters 8 and 25. These taxa exhibit a dense pad of setae on the ventral surface of each side of the bilobed tarsal segment 3 (char 8) and an apotypic scape vestiture of setae only, no scales (char 25). This latter character underwent a reversal to the plesiotypic state in *Diamimus* and outside of this clade, the apotypic state arose independently in the common ancestor of *Plinthodes, Acmaegenius, Triglyphulus,* and *Trichalophus,* as well as in *Adaleres.*

The adelphotaxon relationship of *Lepidophorus* and *Dirotognathus* is supported by a shared apotypic condition of primary character 35, in which the prementum is reduced in size relative to the buccal space and other mouthparts such as the maxillae. This species pair is supported also by apotypic states of secondary characters 3, 17, and 20.

The common ancestry of the 16 genera from *Crocidema* to *Paranametis* (Fig. 78) is supported by an apotypy of character 11, and by reversals of characters 4 and 12, discussed above. These taxa exhibit the apotypically obliterated metepisternal suture (state 2, character 11), with some exceptions. In species of *Lepesoma*, some species of *Panscopus* and some of *Peritaxia* this character apparently has undergone a reversal to the condition in which the suture is partly or completely visible. The obliterated condition (state 2) of the

suture is also present, homoplastically, in *Dirotognathus* , *Rhigopsis* and is partially visible in *Miloderes* .

The subsequent branching point in the cladogram (Fig. 78) is a polychotomy among the genera *Crocidema, Pseudorhimus, Orimodema, Melanolemma, Diamimus,* and the common ancestor of the 11 genera from *Leptopinara* to *Paranametis* . Phylogenetic relationships among these six lineages remain unresolved.

The common ancestry of the 11 genera from *Leptopinara* to *Paranametis* (Fig. 78) is supported by the shared apotypic condition of the secondary character number 13, in which the basal margin of the elytron is perpendicular before merging with the mesonotum. This character apparently has undergone a reversal in *Connatichela and Lepesoma* in which the disc of the elytron curves smoothly, at the basal margin where it meets the mesonotum. Outside of this clade, the apotypic state arises independently, in this reconstruction, in *Dirotognathus*, in (*Plinthodes +Acmaegenius*), in *Adaleres* , and in *Rhigopsis* .

The same 11-genus clade is supported also by a reversal of character 18, to a condition in which scales are dense and overlapping on the dorsal surface of the elytra. The exception to this is *Tropiphorus* in which the scales are non-overlapping (state 1). most genera in the tribe have either non-overlapping scales on the elytra (state 1) or have no scales on the elytra (state 2).

The common ancestry of *Leptopinara* , *Peritaxia,Connatichela, Dichoxenus*, and is supported by the apotypic condition of the secondary character 5 in which the scar on the mandible is elevated slightly. This state has, in this reconstruction, reversed to the plesiotypic state in *Dichoxenus*. The apotypic state of this character has arisen independently in *Phyxelis* and *Rhigopsis* .

The common ancestry of *Peritaxia* ,*Connatichela*, and *Dichoxenus* is supported by apotypic reversals of characters 26 and 31. The adelphotaxon relationship between *Connatichela* and *Dichoxenus* is supported by an apotypic reversal of character 15.

The clade including seven genera from *Anametis* to *Paranametis* , (Fig. 78), is supported by an apotypy in the secondary character 37 (state 2) in which some form of small projection is present on the prosternum between and behind the front coxae. This condition is lacking in *Amphidees* and *Paranametis* . Apotypic states of some form of prosternal projection have arisen independently in *Miloderes* and in *Trichalophus* .

The evidence suggesting a close relationship between *Panscopus* and the genera *Phyxelis, Tropiphorus, Lepesoma, Amphidees* and *Paranametis* is an apotypic condition of character 17 in which the number of setae on the prementum is reduced to one pair or none, on the ventral surface. The exception within this clade is *Lepesoma,* in which three or four pairs of setae are present. This character is quite homoplastic among taxa of the Leptopiini and forms only a weak and variable trend toward the glabrous state. As mentioned above, representatives of the tribes of entimines all exhibit four pairs or more of setae on the prementum.

The evidence supporting the common ancestry of the genera *Phyxelis, Tropiphorus, Lepesoma, Amphidees* and *Paranametis* involves apotypic conditions of convincing, primary characters of the female genitalic armature. This involves an apotypic lateral compression of the female genitalic armature in which the apical portion of tergum 8 (char 41), the spiculum ventral (char 42), and the coxites (char 43) are laterally compressed . In the plesiotypic state tergum 8 is broadly rounded dorsally and apically or in some species slightly triangular in shape, rounded apically, the spiculum ventrale (sternum 8) has a broad shovel-shaped portion apically, and the coxites are cylindrical, or broadly angular in dorsal view and rounded apically in lateral view.

The apotypic states of these characters occur in some, but not all of the species of *Tropiphorus, Lepesoma,* and *Amphidees* and in *Phyxelis* and *Paranametis* . This apotypic condition occurs also in *Premnotrypes*, of the tribe Premnotrypini, as discussed above. The distribution of these characters suggests that the genera *Amphidees, Lepesoma,* and possibly *Tropiphorus* are not monophyletic taxa as presently comprised. Additional systematic study of these taxa is required to place the generic classification on a phylogenetic basis. Similarly, relationships among these genera, and among the genera of Premnotrypini should be studied, and the generic and tribal level classification revised, as necessary.

In this reconstruction, the apparent adelphotaxon relationship between *Phyxelis* and *Tropiphorus* is supported by apotypies of the secondary, or homoplastic characters 5, 6, 12, 20, 33, and 37. The *Lepesoma–Amphidees–Paranametis* clade is supported by reversals of characters 3 and 37, and the *Amphidees–Paranametis* pair of taxa is supported by a reversal of character 26, and a further reversal in the state of character 37.

Implications for outgroup relationships of Panscopus – In this reconstruction (Figure 78), the taxa most closely related to *Panscopus* are *Phyxelis, Tropiphorus, Lepesoma, Amphidees* and *Paranametis* . The next most closely related taxon is *Anametis* . These taxa have been used as outgroups, to determine the polarity of character states in subsequent phylogenetic analysis of species of the genus *Panscopus* .

Relationships among species of *Panscopus*

As with the genera of the tribe, the number of taxa in this analysis (28), was too large for exact methods, so a heuristic approach was was applied, using 100 repetitions of the search technique. Character states were polarized relative to the outgroup clade which includes the genera *Phyxelis, Tropiphorus, Lepesoma, Amphidees* and *Paranametis* . Ancestral states of all characters were coded zero, and trees were rooted relative to a hypothetical outgroup bearing the hypothesized ancestral state of each character.

Analysis of characters and states – Characters are listed in the order in which they appear in the character matrix (Table 30) and in the cladogram (Fig. 79). Most characters were treated as ordered, with state zero representing the plesiotypic condition, and states 1, 2, etc. representing successive apotypic conditions. Exceptions were character 19, the presence of spicules in the internal sac of males, and character 20, the shape of the apex of the male aedeagus. For each of characters 19 and 20 the plesiotypic condition was

determined easily, but it was not possible to determine that any of the apotypic states was derived from any of the other states in a transition series, or whether all were derived, independently, from the plesiotypic condition.

1. Prementum, number of setae. 0, 2 pair or more; 1, 1 pair; 2, none.
2. Elytra, serial pits. 0, each with a seta; 1,narrow scale; 2, each pit with a round or broadly oval scale in it.
3. rostrum, median carina. 0, absent; 1, present.
4. sternum 2, length relative to sterna 3 and 4. 0, sternum 2 shorter than 3+4 combined; 1, sternum 2 equal to 3+4; 2, sternum 2 longer than 3+4.
5. Elytral intervals , topography. 0, flat or equally convex; 1, alternate intervals raised, or carinate.
6. Transverse concavity separating frons and rostrum. 0, absent, or slight depression present; 1, distinct concavity present- frons and rostrum clearly separated in lateral view.
7. pronotal topography. 0, irregular, rugose and/or tuberculate; 1, round raised areas, each with a seta.
8. Prementum, location of setae. 0, on the ventral face, or setae absent; 1, setae near apical margin.
9. Scutellum. 0, visible, small; 1, not visible.
10. Even elytral intervals. 0, with a row of setae; 1, nonsetose, or nearly so.
11. Tibia 2, denticulations on inner margin. 0, stout spines present; 1, thin setae only.
12. Alternate elytral intervals, setae. 0, single row of setae; 1, partly double row or double row present; 2, partly triple row, or more.
13. Pronotal longitudinal sulcus. 0, absent; 1, indistinct or incomplete; 2, complete; 3, broad and pronounced.
14. Tibia 1 denticulation on ventral edge. 0, spines visible in apical portion; 1, thin, seta-like.
15. Elytral setae. 0, thin, seta-like; 1, slightly flattened, blunt ended; 2, broadly flattened, scale-like.
16. Elytral humeral angles. 0, rounded; 1, sinuous.
17. Intervals 7 & 9, converge. 0, at base of elytra; 1, a short distance posterior to anterior margin of elytron.
18. Mandible, carina at posterior margin of scar. 0, absent; 1, present.
19. Male aedeagus, spicules of internal sac. 0, absent; 1, field of spicules anteriad the belt of tegmen (inverted sac); 2, field of spicules present posterior to the belt of the tegmen (inverted sac).
20. Male aedeagus, shape of apex. 0, broadly rounded; 1, angular, slight acuity at middle; 2, long acute projection; 3, broad, spatulate projection.
21. Metepisternal suture. 0, obliterated; 1, visible.
22. Female bursa copulatrix, sclerites. 0, absent; 1, two crescent-shaped sclerites present.

23. Elytral setae, angle. 0, semi-erect to erect (greater than 45°); 1, decumbent (between 10° and 45°); 2, appressed (less than 10°).
24. Scape length. 0, extended to front or middle of eye; 1, extended to hind margin of eye when next to head.
25. Pronotal shape. 0, widest at middle; 1, widest anterior of middle.
26. Frons and rostrum, continuous. 0, at least a slight transverse depression separating frons from rostrum; 1, transverse depression absent, frons and rostrum continuous in lateral view.
27. Frons and Rostrum, relative width. 0, frons wider; 1, rostrum equal to or wider than frons.
28. Scape vestiture. 0, setae and scales; 1, setae only.
29. Female abdominal sterna. 0, five visible sterna; 1, four visible sterna (6 and 7 fused).
30. Male internal sac of aedeagus, v-shaped pair of sclerites. 0, absent; 1, present.
31. Elytral scales. 0, round; 1, oval.
32. Pronotal Length relative to width. 0, wider than long; 1, equivocal; 2, longer than wide.
33. Male aedeagus, sclerites of internal sac. 0, absent. 1, small v-shaped piece, and larger horseshoe-shaped sclerite. 2, small v-shaped sclerite only.
34. Rostrum, lateral carina. 0, absent; 1, present, rostrum is tricarinate.
35. Tibia 3, spines on ventral inside margin, 0, thin, seta-like. 1, stout spines visible on apical half.
36. Tibia 3 curvature. 0, straight. 1, noticeably curved, with a convex lower margin.
37. Prementum, median carina. 0, absent ; 1, present .
38. Tarsal vestiture. 0, setae only; 1, setae and appressed scales.
39. Abdominal sternum 1, male. 0, concave at middle; 1, not so.
40. Elytral scales. 0, overlapping; 1, not overlapping.
41. Male internal sac, paired flagellum-like sclerites. 0, absent; 1, paired flagellum-like sclerites present (Fig. 56).
42. Prementum shape. 0, round 1, quadrate.

Reconstructed phylogeny – Hypothesized phylogenetic relationships among the species of the genus *Panscopus* are presented in the cladogram in Figure 79, and Figure 80 indicates the subgeneric names which have been applied to monophyletic clades. The heuristic search analysis with PAUP as described above, using the character matrix presented in Table 30, of 28 taxa (including the "outgroup") and 42 characters, produced 437 equally most parsimonious trees with a length of 144 character steps. The cladogram presented in Figure 79 was selected from among those, initially by filtering the 437 trees through a constraints tree. A constraints tree is simply an unresolved statement of the phylogenetic relationships among the taxa in question. The

constraints tree used in this selection process required that 13 species from *P. johnsoni* to *P. squamifrons* at the right hand side of the cladogram in Figure 79 be placed within a clade, based on an apotypic shape of the apex of the male aedeagus, which is in these species slightly angular with a slight acuity at the middle (state 1, character 20). The constraints tree also required that the species *abruptus* and *rugicollis* be placed as adelphotaxa, based on the shared apotypic presence of a median carina on the prementum (state 1, character 37). This filter reduced the 437 trees to 32 in number, and one tree was selected from among these, by mental analysis, based on my knowledge of the distribution of various character states among the taxa, and a subjective unweighting of characters known to be excessively homoplastic.

The monophyly of this genus is, in this reconstruction (Figure 79), supported primarily by the presence of a round, or nearly round scale in each of the serial punctures of the elytral striae (character 2) This is an apotypy shared by all of the species of the genus, with the exception of *P. alternatus* Schaeffer, in which each serial pit contains a narrow scale (dorsally) or seta (laterally) on the elytra. The monophyly of *Panscopus* is supported by several secondary characters. Characters in this reconstruction are deemed secondary when they exhibit homoplasy in the ingroup or the outgroup, or both. The number of setae on the ventral surface of the prementum (character 1) is apotypically reduced to one pair, basally in the genus. However, this character is homoplastic in the outgroup, with a more plesiotypic two or more pairs present in some of the outgroup taxa (see above comments on relationships among genera of Leptopiini). This apotypic condition is further reduced, in the ingroup to a completely glabrous mentum in representatives of all of the species of the subgenera *Pseudopanscopus, Dolichonotus, Phymatinus,* and *Nocheles* (Fig. 80). The monophyly of *Panscopus* is supported also by an apotypic presence of a median carina on the dorsum of the rostrum (character 3), but a reversal of this character is required in the *P. costatus - P. capizzii* species pair and in the seven- species clade from *P. bufo* to *P. rugicollis* (Fig. 79). Character 4 also supports the monophyly at this node in the reconstruction, as most species of *Panscopus* exhibit an apotypically long abdominal sternum 2, in which sternum two is equal to or greater than the length of sterna 3 and 4 together. This character must undergo a reversal to the plesiotypic state in *P. ovatipennis*, in the *P. longus - P. torpidus - P. ovalis* clade, and in the *P. schwarzi - P. coloradensis* species pair. The monophyly of *Panscopus* is supported at the basal node by character 5 in which the alternate elytral intervals are, in the apotypic state, raised, or carinate. This character is homoplastic, requiring a reversal to the plesiotypic state in *P. maculosus* , in the *P. squamosus - P. michelbacheri* species pair, and in the *P. aequalis - P. squamifrons* species pair. This character is additionally homoplastic, as the raised alternate intervals appear also in the elytra of some species of *Lepesoma* among the outgroup taxa. Character 6 also supports this monophyly of *Panscopus* as, at this point in the phylogeny the common ancestor must have gained the apotypic deep transverse depression at the base of the frons, giving the frons and rostrum a markedly discontinuous appearance in lateral view. This character has undergone a reversal to the plesiotypic condition in the common ancestor of *convergens* and the species to the right of it in Figure 79.

The first branching, in the phylogeny of *Panscopus* species, is between the common ancestor of the *P. maculosus - P. ovatipennis* species pair, and the common ancestor of all of the other species in the genus. The monophyly of the *P. maculosus - P. ovatipennis* pair is supported by the primary characters 7 and 8. Character 7 exhibits an apotypic arrangement of round raised areas, each with a central seta, on the pronotum. Character 8 exhibits an apotypic state in which, as Buchanan (1936) pointed out, the setae of the prementum are located at or near the anterior margin, rather than one third to half way back on the ventral surface, as in the plesiotypic condition. The common ancestry of the *P. maculosus - P. ovatipennis* species pair is supported also by the secondary characters 9, 10, and 11. Character 9 involves a reduction in the size of the scutellum; in the apotypic state, it is not visible at the level of the surface of the elytra; in the plesiotypic condition it is small, but visible at the level of the elytral surface. This character is homoplastic as the apotypic condition is also exhibited by *P. impressus,* by the *P. costatus - P. capizzii* species pair, and by *P. michelbacheri* . The apotypic state of character 10 is a non-setose condition of the even elytral intervals, in contrast to the plesiotypic condition in which there is a row or partial row of setae along the length of the even intervals. This character supports the common ancestry of the *P. maculosus - P. ovatipennis* species pair, at this level of the cladogram, but this character is homoplastic with the apotypic state also occurring in *P.erinaceus* , in the *P. longiscapus - P. squamosus - P. michelbacheri* clade, as well as in several species in the subgenus *Nocheles* . The apotypic condition of character 11, in which the stout spines of the ventral margin of tibia 2 are absent, or not distinguishable from the surrounding setae, supports the common ancestry of the *P. maculosus - P. ovatipennis* pair, but this character , too, is homoplastic. This reconstruction requires that the apotypic condition of this character has arisen independently in *P. alternatus* , *P. capizzii* , *P. convergens* , *P. oregonensis* , *P. squamosus* , *P. johnsoni* and in the *P. torpidus - P. ovalis* species pair.

The common ancestry of the remaining species after the divergence of the *P. maculosus - P. ovatipennis* lineage, is supported by four secondary, or homoplastic characters (chars. 12, 13, 14, 15). Most taxa of this clade exhibit an apotypic increase in the number of setae on the alternate elytral intervals, to a partially double row, or more, of setae (char. 12). This condition is reversed to a plesiotypic single row of setae in *P. alternatus, P. bakeri,* and in *P. aequalis* . A further transformation to a triple row, or more of setae on the alternate intervals, is postulated for some of the taxa of this clade. This clade is supported further by the fact that all species in the lineage exhibit at least a partial development of a median longitudinal sulcus on the pronotum, which is absent in the plesiotypic condition (char. 13). A trend among some of the species of this clade is for further development of the pronotal medial sulcus (see below). This clade is supported further by apotypic conditions in characters 14 and 15. In character 14 the stout spines of the ventral edge of tibia 1 are apotypically thin and seta-like and not apparent. This condition is reversed to the plesiotypic state in *P. alternatus*, in the subgenus *Dolichonotus* and in *P. squamosus, P. johnsoni* , and in *P. torpidus*. In character 15, the setae of the elytral surface, which are plesiotypically thin, acute and seta-like, are in most species of this clade, apotypically flattened and blunt -ended. This condition is reversed to the plesiotypic state in *P. acutisetus* , *P. longus*, and in the *P. aequalis - P.*

squamifrons species pair. The apotypic state is further modified to a broadened, flattened, scale like condition in *P. johnsoni - P. bakeri* and most markedly so in the *P. costatus - P. capizzii* species pair.

The next branching point in the reconstruction (Fig. 79), is the divergence of the common ancestor of the subgenus *Panscopus sensu stricto* (*P. alternatus - P. erinaceus - P. impressus*) from the ancestor of the species comprising the subgenera *Pseudopanscopus, Dolichonotus, Phymatinus* , and *Nocheles* (the 22 species from the right-hand end of Fig. 79).

The monophyly of *Panscopus sensu stricto* (*P. alternatus - P. erinaceus - P. impressus*) is supported by the primary characters 16 and 17. In the apotypic condition of character 16 the elytral humeri are sinuous, in dorsal view as pointed out by Buchanan (1936), in contrast to the more rounded plesiotypic condition . In the apotypic condition of character 17, elytral intervals 7 and 9 converge a short distance from the anterior margin of the elytron, rather than converging at or near the anterior margin of the elytron . The monophyly of *Panscopus sensu stricto* is supported also by the secondary characters 18 and 19. In the apotypic condition of character 18 a carina is visible, posteriorly on the mandible, behind the scar. This condition is also seen in *P. maculosus* and in *P. acutisetus* . In one apotypic condition of character 19, a field of spicules is visible in the internal sac of the male aedeagus, anterior to the belt of the tegmen (Figures 54, 55). A field of spicules occurs in approximately the same location in the male sac of *P. johnsoni* and *P. bakeri* (Figs. 63, 64), but in this instance the spicules are smaller and greater in number and it seems likely that this condition is independently derived, even though I coded it as the same character state.

Within the subgenus *Panscopus,* the common ancestry of *P. erinaceus* and *P. impressus* is supported by an apotypy of character 35 in which there are stout spines visible on the ventral edge of tibia 3, in the apical third. These stout spines appear to have arisen independently in most of the species of the clade which includes the species from *P. tricarinatus* to *P. rugicollis* (Fig. 79).

The common ancestry of the four subgenera including 22 species from *P. costatus* to *P. rugicollis*, is supported by the primary characters 1 and 20 as well as the secondary character 13. All species of this clade exhibit the second apotypic condition (1') of lacking setae on the prementum. In addition, all species exhibit one of a few apotypic conditions of the apex of the male aedeagus (char. 20), although these apotypic states do not form an obvious transition series and may all be independently derived. Secondary support for this lineage is provided by most of the species of the clade exhibiting one of the further apotypic states of character 13, in which the pronotal sulcus is more fully developed (13'), or is very broad and pronounced (13"). Some reversal of this character is evident, in that *P. oregonensis* , *P. acutisetus*, (*P. longiscapus - P. squamosus - P. michelbacheri*),. *P. coloradensis*, and (*P. aequalis - P. squamifrons*) all exhibit the first apotypic condition of a partial, or incomplete pronotal sulcus.

The next divergence in the reconstruction, is between the common ancestor of the *P. costatus - P. capizzii* species pair and the common ancestor of the 20 species to the right in the cladogram.

Primary support for the *costatus - capizzii* species pair comes from characters 13 and 21. In the most apotypic state of character 13 (13"), the median longitudinal sulcus is very broad and pronounced, which occurs only in P. *costatus* and *P. capizzii*. In the apotypic state of character 21, the metepisternal suture is visible as a thin line along its length. This state is shared by these two species and no others. In the plesiotypic state the metepisternal suture is obliterated, either completely, or for most of its length, with only a very short portion visible near coxa 3. Additional support for this species pair comes from a reversal of character 3. In these two species the median carina on the dorsal surface of the rostrum is absent. Additional secondary support for this species pair comes from the homoplastic characters 9 and 15. In the apotypic state of character 9, shared by *P. costatus* and *P. capizzii*, the scutellum is reduced in size and is not visible at the level of the surface of the elytra. As mentioned above, this state occurs also in *P. maculosus - P. ovatipennis* and in *P. impressus* and P. *michelbacheri*. In the most apotypic state (15') of character 15, the elytral setae are broadly flattened, blunt ended and quite scale-like. This condition is most pronounced in the *P. costatus - P. capizzii* species pair, but similarly broadened elytral setae (coded as the same state of this character) also occurs in *P. squamosus* and in the *P. johnsoni - P. bakeri* species pair.

The common ancestry of the 20 species from *P. convergens* to *P. rugicollis*, is supported by an apotypy of the primary character 22. All species in this clade for which females are known, exhibit a pair of crescent-shaped sclerites in the bursa copulatrix (Figs. 34-52). In the plesiotypic state, these sclerites are absent. Data for this character are missing for the species P. *oregonensis* and *P. acutisetus*, as female specimens are as yet unknown. I predict that if more specimens of these species are found, including females, the bursae will contain these crescent-shaped sclerites. Additional support for this clade comes from the secondary character number 23. Most of the taxa of this clade exhibit decumbent setae on the elytra, rather than the semi-erect setae exhibited in the plesiotypic condition. There is, however, some variation in this character, as *P. squamosus* has setae which are appressed, or nearly so, *P. longus* exhibits a reversal to the semi-erect state, and the species P. *rugicollis*, *P. aequalis*, and *P. squamifrons*, are polymorphic, exhibiting both state 0 and 1, for this character. Additional support for this clade is exhibited by character 6, which undergoes a reversal at this node, with all species of the group exhibiting a less pronounced transverse depression at the base of the rostrum, than do the taxa of the more basal lineages in the genus.

The common ancestry of the three species of the subgenus *Dolichonotus* (*P. convergens - P. oregonensis - P. acutisetus*), is supported by an apotypy of the secondary character 24. These species exhibit an apotypically long scape which extends to the hind margin of the eye when resting next to the head. A long scape is seen also in the *P. longiscapus - P. squamosus - P. michelbacheri* clade. Additional support for the common ancestor of *P. convergens - P. oregonensis - P. acutisetus*, is in a reversal of character 14, in that stout spines are visible along the ventral margin of tibia 1.

The common ancestry of *P. oregonensis* and *P. acutisetus* is supported by an apotypy of character 25 in which the pronotum is shaped such that it is

widest at a point anterior to the middle, in contrast to the plesiotypic condition in which the midpoint of the length of the pronotum, is its widest point. The species *P. torpidus* also exhibits this apotypy. An apotypy of the secondary character 26 also supports this species pair. This represents a further apotypic reduction of the transverse depression at the base of the rostrum, so that the frons and rostrum appear continuous, in lateral view. This condition also occurs in the subgenus *Phymatinus* and in the *P. aequalis - P. squamifrons* species pair. The common ancestry of *P. oregonensis* and *P. acutisetus* is also supported by a reversal in character 13 from the second apotypic state of having a complete pronotal sulcus, to the first apotypic state in which the sulcus is present, but incomplete.

The common ancestry of the species collectively in the subgenera *Phymatinus* and *Nocheles* (the 17 species from *P. gemmatus* to *P. rugicollis* in the cladogram) is supported only by an apotypy in the secondary character 27 in which the relative width of the frons is equal to or less than the width of the rostrum. This subsequently undergoes reversal in *P. michelbacheri*, *P. torpidus*, *P. abruptus* and the *P. aequalis - P. squamifrons* species pair.

The common ancestry of the four species of the subgenus *Phymatinus* (*P. gemmatus, P. longiscapus, P. squamosus,* and *P. michelbacheri*) is supported by a primary apotypy of character 20, in which the apex of the male aedeagus is extended into a broad flat projection (Figs. 59-62). This clade is supported also by the secondary characters 26, and 28. In character 26 the transverse depression at the base of the frons is absent, so that the frons and rostrum appear continuous in lateral view. This condition, as mentioned above, is present also in the *P. oregonensis - P. acutisetus* and *P. aequalis - P. squamifrons* species pairs. In character 28, the apotypic state exhibited here is a scape vestiture of setae only, rather than setae and flat scales as in the plesiotypic condition. The apotypic state is exhibited also by *P. maculosus* and P. *oregonensis* .

The common ancestry of *P. longiscapus* , *P. squamosus* , and *P. michelbacheri* is supported by three primary characters. In character 29, the apotypic state involves a fusion of abdominal sterna 6 and 7 of the female, so that only four sterna are visible. In the apotypic state of character 30, a v-shaped pair of sclerites is present in the male internal sac (Figs. 60, 61, 62). In the second apotypic state of character 19, a field of spicules is present posterior to the belt of the tegmen in the male internal sac, in its inverted position. Additional support for this clade is provided by apotypies of the secondary characters 10, 12, and 24, as well as by a reversal in character 13. The apotypic state of character 10, in which the even intervals of the elytra are non-setose, is a homoplastic condition which occurs in a number of other species (Fig. 79, Table 30). The second apotypic state of character 12, in which alternate elytral intervals have a partly triple, or more, row of setae, supports this clade but is also exhibited by *P. costatus, P. ovalis, P. abruptus* and by the *P. schwarzi - P. coloradensis* species pair. The apotypic state of character 24 in which the scape is long, extended to the hind margin of the eye, or further, supports this clade, but as mentioned above, also occurs in the three species comprising the subgenus *Dolichonotus* (*P. convergens, P. oregonensis, P. acutisetus*). Secondary support for the common ancestor of *P. longiscapus* ,

P. *squamosus* , and *P. michelbacheri* is also provided by a reversal in character 13 from the second apotypic state of having a complete pronotal sulcus, to the first apotypic state of having an incomplete sulcus. The same reversal has happened, according to this reconstruction, in the *P. oregonensis* - *P. acutisetus* species pair, as mentioned above, as well as in *P. coloradensis* and in the *P. aequalis* - *P. squamifrons* species pair.

Support for the common ancestry of *P. squamosus* and *P. michelbacheri* comes from the secondary character 31. An apotypically oval shape of the elytral surface scales rather than the plesiotypic round condition is exhibited by this species pair, but also by *P. erinaceus* and *P. oregonensis* . Additional support for the *P. squamosus* - *P. michelbacheri* lineage comes from a reversal of character 5, to the plesiotypic state of having equally convex intervals of the elytra, rather than the apotypic state of having the alternate intervals slightly raised, or somewhat carinate, as in most of the species of this genus. Such a reversal has also occurred, in this reconstruction, in *P. maculosus* and in the *P. aequalis* - *P. squamifrons* pair of species.

The evidence for the common ancestry of the 13 species of the subgenus *Nocheles* (*P. johnsoni* to *P. rugicollis* in Figs. 79 and 80), is an apotypy in the shape of the apex of the aedeagus (character 20, which is angular with a slight acuity at the midline (Figs. 63-73)).

The common ancestry of *P. johnsoni* and *P. bakeri* , is supported by apotypies of the secondary characters 15, 19 and 32. The second apotypic state of character 15 is the presence of elytral setae which are broadly flattened, blunt ended and scale-like. As noted above, similarly broad scale-like elytral setae are seen also in the *P. costatus* - *P. capizzii* pair, and in *P. squamosus*. An apotypic state of character 19 in which a field of spicules is present anterior to the belt of the tegmen in the inverted internal sac of males (Figs. 63 and 64) is exhibited by the two species in question, but as noted above a somewhat similar field of spicules is seen in the internal sac of males of subgenus *Panscopus sensu stricto* , which is here assumed to have arisen independently. An apotypic state of character 32 in which the relative length of the pronotum is either equal to (*P. bakeri*) or greater than (*P. johnsoni*) the width, supports this lineage, but similar apotypic proportions of the pronotum can be seen in *P. oregonensis, P. gemmatus, P. tricarinatus, P. schwarzi,* and *P. aequalis* .

The phylogenetic affinity of the eleven species from *P. longus* to *P. rugicollis* in the cladogram is evidenced by apotypies of the primary character 33, and by the secondary character 10. In the apotypic state of character 33 there are two sclerites visible in the internal sac of males. One is a large horseshoe-shaped structure and the other, a small v-shaped sclerite within the larger one (Figs. 66-73). This in turn becomes further modified in *P. tricarinatus* to a state where the small v-shaped sclerite is still evident, but the large horseshoe-shaped structure has been lost. Within this clade of eleven species there are four- *P. longus, P. ovalis, P. rugicollis* and *P. aequalis* , for which data is missing for this character. Males are unknown for these species. The parsimony analysis has placed them in this clade based on a number of other characters at different levels in the analysis. If this reconstruction is correct, it would predict that if males are found for these four species, they will posses this apotypic arrangement of sclerites in the internal sac. Additional

support for this 11- species clade is in an apotypic state of character 10 in which the even elytral intervals are non-setose. This is, as discussed above, a homoplastic character and the apotypic state is seen also in *P. maculosus - P. ovatipennis, P. erinaceus, P. longiscapus - P. squamosus - P. michelbacheri,* and in *P. johnsoni* . This character has undergone reversal to the plesiotypic state in *P. ovalis, P. schwarzi,* and *P. abruptus* .

The common ancestry of *P. longus, P. torpidus* and *P. ovalis* is supported solely by a reversal in character number 4, to a plesiotypic state in which the length of abdominal sternum 2 is less than the combined length of sterna 3 and 4. A similar reversal has occurred in *P. ovatipennis* and in the P. *schwarzi - P. coloradensis* species pair.

The common ancestry of the *P torpidus - P ovalis* species pair is supported by apotypies of the secondary characters 11 and 34. The apotypic condition of character 11 in which there are no spines on the ventral edge of tibia 2, appears, as discussed above in several other species in the genus. The apotypic state of character 34 is the presence of lateral longitudinal carinae on the dorsal surface of the rostrum which gives it a tricarinate configuration. This tricarinate rostrum is also evident in *P. alternatus* and in *P. tricarinatus.*

The common ancestry of the clade including eight species from *P. tricarinatus* to *P. rugicollis* is supported by an apotypy of secondary character 35. These species exhibit apotypic spines on the inside edge of tibia 3 in the apical third. This character is homoplastic as such spines on tibia 3 can be seen in the *P. erinaceus - P. impressus* species pair, and this state undergoes a reversal to the plesiotypic condition in *P. coloradensis* .

The common ancestry of the seven species from *P. bufo* to *P. rugicollis* is supported by an apotypy of secondary character 36 and a reversal of character 3. In these species tibia 3 is apotypically curved ventrally , an apotypy exhibited elsewhere in the phylogeny by *P. alternatus*, and which, in this reconstruction, must undergo a reversal to the plesiotypic straight tibia 3, in *P. squamifrons* . Character 3 involves a reversal, in this lineage a loss of the median carina of the rostrum, a reversal which must have happened also in the *P. costatus - P. capizzii* pair of species. This median rostral carina must have appeared a second time in *P. abruptus* .

The next branching point in the reconstruction is a trichotomy of *P. bufo,* the common ancestor of *P. schwarzi* and *P. coloradensis*, and the lineage which gave rise to the four species *P. abruptus, P. rugicollis, P. aequalis*, and P. *squamifrons* .

The common ancestry of *P. schwarzi* and *P. coloradensis*, is supported by an apotypy of the secondary character number 12, and a reversal of character 4. The second apotypic state of character 12, having a triple row of setae on alternate intervals, supports this clade but also occurs in *P. costatus,* in the *P. longiscapus - P. squamosus - P. michelbacheri* clade, and in *P. ovalis* and *P. abruptus* . The reversal in character 4 to a plesiotypic state in which abdominal sternum 2 is shorter, in length than 3 + 4 combined. The same reversal also occurs also in *P. ovatipennis* and in the *P. longus - P. torpidus - P. ovalis* clade discussed above.

The common ancestry of the four-species clade which includes *P. aequalis, P. squamifrons, P. abruptus* and *P. rugicollis* is supported by a reversal of character 27 and an apotypy of character 38. In this reconstruction, character 27 reversed to the plesiotypic state in which the frons is wider than the rostrum. The same reversal happened also in *P. michelbacheri* and in *P. torpidus*. The apotypic state arose subsequently a second time in *P. rugicollis* within this clade.

The common ancestry of the *P. aequalis - P. squamifrons* pair of species is supported by an apotypy of the secondary character 26, as well as by reversals of characters 5, 13, and 15. The apotypic condition of character 26, of the transverse depression at the base of the frons being reduced to absent, so that the frons and rostrum appear continuous in lateral view, supports this adelphotaxon relationship. This same apotypic condition is also exhibited by the *P. oregonensis - P. acutisetus* adelphotaxa, and in the four species of the subgenus *Phymatinus*. The reversal in character 5 to the plesiotypic state in which the elytral intervals are equally convex or flat, rather than having alternate intervals raised as in the apotypic state exhibited by most species of the genus, supports the *P. aequalis - P. squamifrons* pair. The same reversal to the plesiotypic state is seen in *P. maculosus* and in the *P. squamosus - P. michelbacheri* pair. The reversal of character 13 from the second apotypic state of having a complete pronotal sulcus , to the first apotypic state of an incomplete pronotal sulcus supports the common ancestry of *P. aequalis* and P. *squamifrons*. The same reversal in character 13 is seen in the P. *oregonensis - P. acutisetus* pair, in the *P. longiscapus - P. squamosus - P. michelbacheri* clade and in *P. coloradensis*. Additional support for the common ancestry of *P. aequalis* and *P. squamifrons* is a reversal in character 15, from an apotypic state of having broad flattened, blunt-ended setae on the elytra to the plesiotypic state of having thin, acute, hair-like setae. The same reversal in this character has occurred in *P. acutisetus* and in *P. longus*.

The evidence for the adelphotaxon relationship between *P. abruptus* and *P. rugicollis* is in a shared apotypy of character 37, in which a longitudinal median carina is present on the prementum.

Several characters included in this analysis conflict with the characters discussed to this point, and which did not contribute to the most parsimonious tree topologies in this reconstruction. These characters were left in the matrix, despite the fact that they act to reduce the consistency index of this reconstruction (0.38), in the interest of giving the reader some idea of the conflicting characters, or rampant homoplasy, which made a reconstruction of phylogenetic relationships among the species of *Panscopus* to be so difficult to carry out.

An apotypic state of character 39, in which the male of the species have abdominal sternum 1 flat or convex, is exhibited in *P. capizzii* and in *P. bakeri*. In the plesiotypic state exhibited by all other species of *Panscopus* and related genera, males are concave at the midline of abdominal sternum 1 and to a lesser extent in abdominal sternum 2. The females have convex abdominal sterna. Upon closer inspection the condition in these two species is probably not homologous. In *P. capizzii* both sexes have flat abdominal sternites. In *P. bakeri* the females have a convex shape similar to the females of most other

species, but the males are flat or slightly convex in the shape of their abdominal sterna.

Evolution of characters – This study presents many conflicting characters, such that any reconstruction one might arrive at using this data, necessarily will require that most of the characters exhibit homoplasy, with apotypic states arising numerous times, apparently independently, and many reversals from an apotypic to a plesiotypic state. Few character transformation series are apparent which can be traced through successive apotypic states, from the basal lineages to the more recently derived lineages in the phylogeny. A few characters can be mentioned in this context.

The number of setae on the surface of the prementum (character 1) exhibits a trend from two or more pairs of setae in most of the outgroup genera, to one pair in the basal lineages of *Panscopus* (*Parapanscopus* and *Panscopus sensu stricto*), to no setae in the remaining clades of the genus.

The transverse depression at the base of the frons, separating the frons and rostrum, in lateral view, shows a trend from the most pronounced concavity (char 6) in the basal three lineages (*Parapanscopus, Panscopus sensu stricto,* and *Pseudopanscopus*) toward a less obvious concavity in the more derived lineages of the genus. This concavity is absent , so that the frons and rostrum appear continuous in lateral view (char 26) in the *P. oregonensis - P. acutisetus* species pair, in the subgenus *Phymatinus* and in the *P. aequalis - P. squamifrons* species pair.

A slight trend is evident toward an increase in number of setae along the alternate elytral intervals (char 12). There is a single row of such setae in the outgroup taxa and in the subgenus *Parapanscopus* , increasing to a partly or complete double row in most of the western species of the genus. This condition is transformed into the further apotypic state of a triple or partly triple row of setae on the alternate intervals of representatives of the (*P. longiscapus + (P. squamosus + P. michelbacheri*)) clade and in the *P. schwarzi - P. coloradensis* species pair.

An inconsistent trend toward an increase in the median longitudinal sulcus of the pronotum (char 13) is recognized. The sulcus is absent from the outgroup taxa and the subgenus *Parapanscopus*, and generally increases in development in most of the *Nocheles* species. This trend is interrupted, however, by the pronotal sulcus reaching its greatest breadth and depth in the *P. costatus - P. capizzii* species pair.

There is also some trend toward a greater ornamentation of the apex of the aedeagus, with the subgenera *Pseudopanscopus, Dolichonotus,* and *Phymatinus* showing the most visually obvious apotypic states, whereas in species of *Nocheles* the apex of the aedeagus is not as greatly produced.

Geographical history

Under this heading I relate aspects of the distribution patterns of species of *Panscopus* to geographical features of known geological age. This provides some insight into how, where, and when some of the speciation events came about. This in turn, is the basis for estimates of the age of the group and the approximate time during which most of the diversification of *Panscopus* species occurred.

Biogeographical methods.– The protocols for cladistic biogeographic analysis first involve the production of a taxon cladogram for the group under study, and subsequent conversion of this cladogram to an area cladogram by substitution of the areas taxa occupy for the taxon names in the original cladogram (Humphries and Parenti, 1986; Wiley, 1988). Then the taxon-area cladogram is converted to a fundamental area cladogram in which each area is represented only once. Problems are created by the fact that, in nature, geographical distributions of organisms are complex. That is, in any group of many species or taxa, some species have restricted ranges, others are widespread, some areas are occupied by numerous taxa, and within the overall area occupied collectively by all of the taxa under investigation, some areas are not occupied by any of the taxa. These problems are dealt with using different sets of conditions, which have come to be referred to as Assumptions 0, 1, and 2, and "Brooks Parsimony Analysis", or BPA. Nelson and Platnick (1981) outlined assumptions 1 and 2, Zandee and Roos (1987) explained assumption 0, and Wiley (1988a, 1988b) discussed "Brooks Parsimony Analysis", BPA). Page (1988, 1989) has summarized and compared these methods. For example, missing areas, can be treated as uninformative, or as primitively absent. Widespread taxa can be interpreted as a plesiotypy, or as evidence that the included areas are sister areas. These various protocols have been developed with the intention of adding logical rigour to the study of biogeography. This is certainly a noble aim, but the attempts have, in some instances overstepped the logical assumptions upon which they are based. For example, where taxa are discretely distributed on land areas which are discretely delimited, then the areas can be treated as the logical analogs of taxa, and cladistic biogeographical methods can be applied. In situations such as continental areas separated by deep oceans, oceanic islands, or analogous areas separated by intervening areas which are inhospitable to the organisms in question, the assumptions might apply. However, for many groups of organisms, the taxa under study are distributed over continuous land areas, habitat requirements of the taxa may not be known adequately, and distributional data for some or all of the taxa may be incomplete because of a lack of collecting of the organisms. In these situations the geographical areas to be compared cannot be defined *a priori,* and are in fact determined by the distributions of the organisms. To apply then, cladistic methods to the analysis of the areas so defined, based on the taxa distributed thereon, seems like circular reasoning. In such circumstances the inference of relationship among areas, making the areas analogous to taxa, and the taxa analogous to characters, of cladistic methodology, may be inappropriate because the underlying assumptions are not met.

Among species of the genus *Panscopus*, the latter situation exists. The taxa are distributed over a continuous land area, the habitat requirements of the species are not well understood, and the distributional data for some of the species are limited. This limited distributional data may reflect either very restricted, possibly relict distributions, or inadequate collecting.

Recent cladistic biogeographical studies of insect groups vary somewhat in the way these methods are applied. Leibherr (1991), in his study of some platynine carabid beetles of Mexico applied the conditions of assumption 0. Terms and components of each taxon area cladogram were coded one, for

species presence in a given area and zero for absence. The resulting matrix was analyzed with a computer phylogenetic analysis algorithm and "fundamental" area cladograms were produced, from which a consensus cladogram was derived. Noonan (1988) used a somewhat more simple method of reducing the area cladograms, by deleting widespread taxa as uninformative and then replacing with a single line any given lineage of species endemic to a given area of endemism. Regardless of the method applied, the end result, in terms of our understanding of patterns of distribution and what they suggest about the evolutionary history of groups of organisms, is similar. Areas of endemism are identified, and zones of disjunction between sister taxa are located. One can relate the zones of disjunction to possible barriers such as biotic, climatological, or geological changes across the zones. With some knowledge of geological, paleoecological and/or paleoclimatological history of the areas in question, correlations can be established between disjunctions and possible vicariant events. This provides insight into the approximate geological age of speciation events between sister lineages, and some speculations can be made concerning the evolutionary history of the group. Such historical biogeographical hypotheses are supported when congruence is found in the areas of endemism and in the zones of disjunction exhibited by different groups of organisms.

This is what I have attempted to do with some of the taxa of the genus *Panscopus* .

Biogeographical analysis of Panscopus *lineages.*– Seven 'zones of disjunction' (Noonan 1988) or 'vicariance zones' (Perkins 1980) are exhibited by sister-taxa pairs of *Panscopus* . The nodes of these sister lineages are numbered arbitrarily on the phylogeny in Figure 81, and Map 19 shows the correspondingly numbered disjunction zones in geographical context. I will discuss each of the seven zones, in turn, and for each I will draw comparisons with similar patterns exhibited by other groups of organisms and I will speculate on barriers, or historical events which might have brought about the vicariant pattern, for each zone.

Zone 1 represents a disjunction between the collective ranges of the sister clades *Panscopus s.s.* including the three species *P. alternatus , P. erinaceus* and *P. impressus* , and the lineage which includes all of the 22 species occurring in western North America. This is a vicariance zone east and west across the Great Plains region of central North America, and is evident in Map 20, showing the collective geographical distribution of weevils of the genus *Panscopus* . Many taxa exhibit such a range disjunction. Among insects, such a disjunction is apparent in sister taxa in chrysomelid beetles of the genus *Neohaemonia* (Askevold 1988), in hydraenid beetles (Perkins 1980), in the genus *Capnura* of capniid stoneflies (Nelson and Bauman 1987), in the *detersa* group of the noctuid moth genus *Euxoa* (Lafontaine 1981), in the *truquii* group of *Schizogenius* (Carabidae)(Whitehead 1972), and in *Calathus* (Carabidae)(Ball and Negre 1972), among many others.

Such a disjunction across the midcontinent might have developed in one of two time periods. One is the Cretaceous transgression of an epicontinental sea separating eastern North America plus Europe (Euramerica) from western North America plus eastern Asia (Asiamerica) This event is dated as Late

Cretaceous (91-97.5 ma)(Hallam 1981, Allen 1983), or very late Early Cretaceous (100 ma)(Hamilton 1983, Allen 1983). This would require that the common ancestor of *Panscopus* species was present, predating this event. This seems quite unlikely, in light of the oldest known fossils of adelognathan weevils being known from the Green River Eocene formation (Crowson, 1981). It seems unlikely also for floristic and climatic reasons which are discussed in the following paragraphs.

A second, and more plausible explanation for this disjunction would make it of Tertiary age. Wolfe (1987b) indicated that Cretaceous floras of the northern Rocky Mountains were very unlike those of Tertiary time. Late Cretaceous floras were mesothermal to megathermal[1] in character, largely broad-leaved evergreen. At least 50-60% of latest Cretaceous lineages became extinct at the K/T boundary. This was followed by an increase in cool adapted or microthermal, mostly deciduous angiosperms and some gymnosperms in the Paleocene epoch. The global warming toward the climatic optimum of the early Eocene epoch permitted broad-leaved forests of subtropical or "paratropical" form to be present in areas which are now part of the high Canadian arctic (Wolfe 1975, 1977; Matthews 1979, 1980) This marked global warming is thought to have eliminated, or very nearly eliminated, microthermal ecosystems from most of the Rocky Mountain region (Wolfe 1987), causing an evolutionary bottleneck, resulting in extinctions of many microthermal lineages. Global cooling after the climatic optimum of the early Eocene, combined with volcanic mountain building in the cordilleran region again created areas where microthermal vegetations developed in the mid and late Eocene (Wolfe 1987). Wolfe (1987) points out that the first known microthermal forests dominated by Pinaceae were early middle Eocene in age and included representatives of the genera *Abies, Picea, Pinus, Pseudolarix* and *Tsuga*. Axelrod and Raven (1985) also point out that representatives of temperate tree genera including *Abies, Picea, Pinus, Betula* and *Populus* were present in the early Eocene. Wolfe (1987) points out further that the genera *Alnus, Ribes, Rubus, Spiraea, Prunus* and *Cornus* were represented in such early middle Eocene floras. This is of interest because adults of extant species of *Panscopus* feed on vegetation of understory shrubs of *Ribes, Rubus, Spiraea (=Holodiscus), Prunus,* and *Cornus,* in what are essentially microthermal forests dominated by trees of the family Pinaceae representing the genera *Abies, Picea,* and *Pinus* and also including representatives of *Betula* and *Populus*. Thus it would seem likely that one or more representatives of *Panscopus* were extant by the mid-Eocene.

The disjunction between eastern and western North American lineages of *Panscopus* necessarily must have been a Tertiary event. The fact that the more basal lineages of *Panscopus* (subgenera *Parapanscopus* and *Panscopus s.s.*, Fig. 80) today occur in primarily broad-leaved deciduous forests and the more derived lineages (subgenera *Pseudopanscopus,*

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[1] Microthermal, mesothermal and megathermal floras are broadly defined as occurring where mean annual temperature ranges are -5°-13°C, 13°-20°C, and 20°-30°C, respectively. Warm month mean temperature, cold month mean temperature, annual range of temperature, and precipitation are also factors in determining major forest types (Wolfe 1979, 1985, 1987a).

Dolichonotus, Phymatinus and *Nocheles*) occur predominantly in coniferous forests in the west, suggests that the deciduous forest habitats are ancestral, and the coniferous montane forests are derived. Possibly as the deciduous forests of the Eocene were pushed southward with global cooling, the ancestral lineages of *Parapanscopus* and *Panscopus s.s.,* became restricted to areas farther south in North America. With Oligocene uplifts of western Cordilleran mountains would have come increasing dominance of microthermal floras in the Rocky Mountain region, and increased drying of the midcontinent due to rainshadow effect. Grasslands were well established in central North America by the Miocene epoch (Matthews 1979, Webb, 1977). I believe this disjunction dates from Oligocene time.

Zone 2 (Map 19) represents a discontinuity between the ranges of the sister species *P. costatus* and *P. capizzii* (Fig. 81). *P. costatus* is known from localities near Puget Sound, the southern mainland of British Columbia, and the southern end of Vancouver Island. These are areas of moist mixed coniferous forests. *P. capizzii* occurs in southern coastal Oregon and northern California in areas of Redwood forests, or at least areas that were redwood forests until relatively recent human history. Five sister-groups of hydraenid beetles support this region as a vicariance zone (Perkins 1980, his zone 2). Perkins pointed out that this zone coincides in location with the Basaltic Plateau formed by giant lava flows which spread out rapidly over areas exceeding 300,000 square kilometres, filling in entire valleys and extirpating any organisms in the area. These flows apparently continued from the Oligocene through the Miocene, continuing locally into the Pleistocene, so resulting disjunctions of biological ranges would have been of lengthy duration. As Perkins (1980) pointed out, dichotomies causally related to these events would date from the late Oligocene or Miocene, 20-25 ma.

Zone 3 represents a disjunction between the range of *P. longiscapus* inhabiting the coastal and Puget Sound - Willamette Valley lowlands of Washington and Oregon, and the range of *P. squamosus* , which occurs in the Blue Mountains area of northeastern Oregon and southeastern Washington. There are obvious habitat differences between these areas, with the Blue Mountains area being drier than the coastal areas to the west, and there are arid plains in between. This disjunction is particularly interesting because the sister lineage of *P. longiscapus* is *P squamosus + P. michelbacheri.* The vicariance zone between the ranges of *P squamosus* and *P. michelbacheri* corresponds, approximately, with zone 2. If this vicariance dates from 20-25 ma, then the divergence of *P. longiscapus* and the common ancestor of *P. squamosus + P. michelbacheri* must have been earlier, during the Oligocene. This suggests that these species of *Panscopus* are very old, which helps to explain the number of very restricted, probably relict distributions in this group.

Zone 4 represents a disjunction between the ranges of *P. bakeri*, on the west side of the Olympic Peninsula of Washington (Fig. 81) and *P. johnsoni*, on the western side of the Puget Lowlands of Washington and the southern mainland of British Columbia. This divergence could date from the orogeny of the Olympic Mountains which were uplifted during the Oligocene, and perhaps part of the Miocene epochs. These distributions are in areas which were

glaciated during Pleistocene time, so the ranges may have shifted considerably, obscuring any more convincing evidence of a vicariant event.

Zone 5 represents a disjunction between the ranges of the sister species pair *P. schwarzi* and *P. coloradensis*. *P. schwarzi* occurs in localities in southwestern Montana, eastern Idaho and the Wasatch and Uintah Mtns in northern Utah. *P. coloradensis* occurs at high elevations at localities in southernmost Colorado and in the White Mountains of eastern Arizona. This appears to represent a disjunction between the southern Rocky Mountain region and the northern Rocky Mountains, including the Wasatch and Uintahs of northern Utah. A similar vicariance zone is exhibited between the distributions of the hydraenid beetle species pair, *Limnebius sinuatus* - *L. utahensis* (Perkins 1980). The same zone of disjunction between taxa inhabiting Southern Rocky Mountains and sister groups occupying middle or northern Rocky Mountains occurs in the genus *Capnura* (Capniidae: Plecoptera) (Nelson and Bauman 1987) and in the *detersa* group of *Euxoa* (Noctuidae:Lepidoptera) (Lafontaine 1981). This vicariance zone probably represents the topographical discontinuity between the so-called southern Rocky Mountains and middle or northern portions of the Rockies. This break in the mountain chain involves lower elevation areas with more arid-adapted vegetation than the montane forest north and south of the zone. This vicariance likely dates from the time of, or shortly after, the orogenies which lifted these mountain systems in the Tertiary Period.

Zone 6 represents a disjunction between the allopatric distributions of *P. maculosus* and *P. ovatipennis* . *P. maculosus* occurs west of the Appalachians in the Ohio River area and in some of the midwestern United States. *P. ovatipennis* occurs in the Appalachians and east of there, as well as in the lower Great Lakes region at Hamilton, Canada. A possible mechanism for the occurrence of this disjunction, is not apparent, unless it represents a vicariance across the Appalachian chain of mountains at a time when climate and vegetation were much cooler, than at present, in the Appalachians. This might have been so during Pleistocene times. *P. maculosus* might have been distributed east of the Appalachians, and *P. ovatipennis* west of them, and an expansion of the range of *P. maculosus* into the Appalachian region might have occurred since the Pleistocene. The overall distribution of the genus *Panscopus* (Map 20) suggests that these weevils are not able to cope with cooler climates, but this could also be attributed to a lack of collecting, especially nocturnal collecting in areas of northern Canada. However, the question of a vicariance dating to the Pleistocene between a species pair which represents the oldest lineage in the genus, seems quite unlikely.

Lastly, zone 7 represents a disjunction between the allopatric geographical distributions of the species pair *P. erinaceus* and *P. impressus*. *P. erinaceus* occurs in the northeastern United States from West Virginia and Maryland through the New England region to southern Canada, and the Great Lakes States, as far west as central Minnesota. *P. impressus* occurs in the southern Appalachians. I am unable to relate this disjunction zone to a paleoclimatic or a geological event. Perkins' zone 6 (1980) in his study of hydraenid beetles, and a similar disjunction in a group of scaritine carabid beetles of the genus *Schizogenius* studied by Whitehead (1972) and cited in

Noonan (1988), appear on maps to occur in almost the same area. However, these are disjunctions between taxa occurring in the Ozarks and in the Appalachians. Ross (1974) indicated examples of Piedmont-Appalachian disjunctions in the stoneflies he studied. It is possible that this species pair too, was originally a Piedmont - Appalachian disjunct, and *P. impressus* has shifted its range northward into the southern Appalachians. This is however, very speculative and a mechanism for such a disjunction and subsequent range shift is not apparent nor is an approximate time frame, for such an occurrence.

Given the evidence, then, for the above vicariant events between taxa, and the form of the phylogenetic reconstruction (Fig. 81), one can estimate a time scale for evolutionary events in the history of the genus.

Disjunction zone 1 (Map 19) can be related causally to drying of the midcontinent due to increasing rainshadow effect of the western orogenies of the Oligocene. Contemporaneously, the broad-leaved and mixed deciduous forests moved southwards, with global cooling that followed the climatic optimum of the Eocene about 50 million years ago. This places the second most basal branching in the phylogeny in the latter half of the Eocene or in the Oligocene. Disjunction zone 2 can be related causally to geological events of 25 - 20 ma, then speciation events between *P. costatus* and *P. capizzii* and between *P. squamosus* and *P. michelbacheri* occurred in the late Oligocene or early Miocene. In addition, the *P. schwarzi - P. coloradensis* speciation event across disjunction zone 5, (one of the most derived sister pairs in the phylogeny) can be related causally to orogenic activities of the Tertiary (Oligocene or Miocene). These disjunctions (1-5) suggest that most of the cladogenesis in the history of this genus likely occurred during early to middle Tertiary time (late Eocene, Oligocene, and perhaps Miocene). Also, the geographical distributions of several of the species in the genus are very restricted, suggesting an old, relict pattern.

It is likely that the late Tertiary (Pliocene) and Quaternary periods, were times of extinction or local extirpation of taxa, with some changes in geographical range. I would not expect that species of *Panscopus* underwent dramatic shifts in distribution, involving distances of thousands of kilometres, through the Pleistocene, as did a number of beetle taxa as documented by Ashworth (1977), Ashworth and Schwert (1991), Coope (1979), and Morgan and Morgan (1980a&b). Weevils of the genus *Panscopus* are flightless, very slow moving, and within their geographical ranges are found only very locally. This suggests that their vagility is low, and therefore I believe a likely consequence of the dramatic climatic and ecological changes of the latest Tertiary and Pleistocene would have been extinctions and local extirpations in this group.

7. CONCLUDING REMARKS

This work has demonstrated that there are major problems in the configuration of taxa in the Entiminae at the generic and tribal levels. This work has contributed major improvements in our understanding of the taxa of *Panscopus* by detailed study of character systems that had not been explored fully previously, by detailed tabulation and mapping of geographical ranges, and by revising the classification on a phylogenetic basis. In addition I have related the history of the taxa to past events, thereby elucidating some aspects of the probable evolutionary history of the group.

Future research is required to better define the limits of the tribes of Entiminae, especially to determine if the Premnotrypini are, phylogenetically, a group of leptopiines. To achieve this goal will require also research to establish the limits of , and relationships among, the genera *Premnotrypes*, *Amphidees*, *Lepesoma*, and others noted in the preceding pages. Ultimately it is desirable to place on a phylogenetic basis the classification of the Leptopiini of the world. A great amount of systematic study at lower taxonomic levels will be required before that goal can be achieved.

Few unique and reliable characters of adults are available to use in keys for species identification and in phylogenetic reconstruction in *Panscopus* and related broad-nosed weevil groups. It is important, and for many groups, still quite possible, with careful examination, to discover new external structural characters. In many taxa, genitalic structures have not been investigated in detail. One avenue into which I have not yet ventured is the application of molecular techniques for comparing DNA among taxa. This would add additional useful characters to any systematic study of leptopiine weevils.

Of course systematic studies like this one are dependent to a large degree on the extent and quality of material available in institutional and private collections. This in turn is a reflection of efforts past and present, in field collection of specimens. It is only in recent years that the efforts of some collectors of phytophagous Coleoptera, and my own field work, have indicated that weevils of *Panscopus* and many other genera of Leptopiini are nocturnal in habit. Increased nocturnal field work should make available new information concerning distributions, host plant affinities, habitat requirements, patterns of geographical variation, and possibly also life histories. This in turn will shed new light on species limits and will improve our ability to relate present day habitat requirements of species to paleobotanical and paleoclimatological information, thus improving our possible understanding of the evolutionary history of a group. Perhaps my contributions will spur others to study aspects of the biology of *Panscopus* species which I have not, or will stimulate interest in further systematic investigation of the Leptopiini and related tribes.

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9. APPENDIX A: TABLES .

Table 1. Descriptive statistics for *Panscopus maculosus* based on 15 females from throughout the range of the species.

Measurement, in mm	Range	Mean	1.5SD	2SE
length overall	6.23 – 8.31	7.45	0.87	0.30
length of pronotum	1.64 – 2.17	1.90	0.22	0.08
width of pronotum	1.92 – 2.64	2.26	0.30	0.10
width of elytra	2.85 – 3.92	3.37	0.40	0.14
length of elytra	3.61 – 5.25	4.51	0.58	0.20
width of head	1.18 – 1.58	1.36	0.17	0.16
width of frons	0.65 – 0.90	0.77	0.11	0.04
length of rostrum	1.18 – 1.64	1.42	0.18	0.06
length of scape	1.12 – 1.55	1.33	0.15	0.05

Table 2. Descriptive statistics for *Panscopus ovatipennis* based on one male and two females from throughout the range of the species.

Measurement, in mm	Range	Mean	1.5SD	2SE
Male				
length overall	5.1	—	—	—
length of pronotum	1.49	—	—	—
width of pronotum	1.71	—	—	—
width of elytra	2.22	—	—	—
length of elytra	2.91	—	—	—
Females				
length overall	6.1	—	—	—
length of pronotum	1.8 – 1.8	1.8	—	—
width of pronotum	2.05 – 2.2	2.12	—	—
width of elytra	2.97 – 3.1	3.04	—	—
length of elytra	3.8 – 4.05	3.92	—	—
width of head	1.3 – 1.4	1.35	—	—
width of frons	0.71 – 0.74	0.73	—	—
length of rostrum	1.21 – 1.30	1.26	—	—
length of scape	1.05 – 1.18	1.12	—	—

Table 3. Descriptive statistics for *Panscopus alternatus* based on eight males and twelve females from the vicinity of Mt. Mitchell, Yancey Co., N.C.

Measurement, in mm	Range	Mean	1.5SD	2SE
Males				
length overall	5.97 – 7.27 (n=10)*	6.49	0.6	0.25
length of pronotum	1.58 – 1.92 (n=12)	1.76	0.16	0.06
width of pronotum	1.80 – 2.11 "	1.98	0.14	0.05
width of elytra	2.34 – 2.59 "	2.46	0.14	0.05
length of elytra	3.61 – 4.18 "	3.84	0.25	0.10
width of head	1.12 – 1.33 "	1.22	0.11	0.04
width of frons	0.59 – 0.71 "	0.66	0.08	0.03
length of rostrum	1.15 – 1.40 "	1.24	0.12	0.05
length of scape	0.84 – 1.24 "	1.10	0.15	0.06
Females				
length overall	6.36 – 7.92 (n=6)*	7.27	0.84	0.45
length of pronotum	1.74 – 1.95 (n=8)	1.86	0.13	0.06
width of pronotum	2.08 – 2.36 "	2.23	0.14	0.06
width of elytra	2.78 – 3.42 "	3.14	0.31	0.15
length of elytra	3.80 – 4.87 "	4.45	0.56	0.26
width of head	1.27 – 1.49 "	1.40	0.12	0.06
width of frons	0.74 – 0.84 "	0.81	0.06	0.03
length of rostrum	1.21 – 1.40 "	1.32	0.09	0.04
length of scape	1.05 – 1.21 "	1.14	0.07	0.03

* Two males and two females had their heads detached, so overall length was not measured for those specimens.

Table 4. Descriptive statistics for *Panscopus erinaceus* based on ten females from Prince Edward Co., Ontario.

Measurement, in mm	Range	Mean	1.5SD	2SE
length overall	6.62 – 8.96	7.62	1.21	0.56
length of pronotum	1.83 – 2.23	2.02	0.22	0.09
width of pronotum	2.26 – 2.82	2.53	0.34	0.14
width of elytra	2.85 – 3.54	3.22	0.38	0.16
length of elytra	3.92 – 5.06	4.44	0.69	0.29
width of head	1.43 – 1.74	1.57	0.17	0.07
width of frons	0.90 – 1.09	1.00	0.11	0.05
length of rostrum	1.30 – 1.71	1.48	0.22	0.09
length of scape	1.02 – 1.24	1.14	0.11	0.05

Table 5. Descriptive statistics for *Panscopus impressus* based on ten males and eight females from Standing Indian Cpgd,.nr. Rainbow Springs, Macon Co., N.C.

Measurement, in mm	Range	Mean	1.5SD	2SE
Males				
length overall	6.49 – 7.79	7.31	0.62	0.26
length of pronotum	1.92 – 2.20	2.06	0.12	0.05
width of pronotum	2.29 – 2.70	2.50	0.16	0.07
width of elytra	2.59 – 3.04	2.77	0.21	0.09
length of elytra	3.80 – 4.24	4.01	0.23	0.10
width of head	1.36 – 1.58	1.48	0.10	0.04
width of frons	0.74 – 0.93	0.82	0.07	0.03
length of rostrum	1.33 – 1.67	1.47	0.14	0.06
length of scape	1.33 – 1.55	1.43	0.09	0.04
Females				
length overall	7.17 – 9.09	8.07	1.04	0.49
length of pronotum	1.92 – 2.29	2.10	0.22	0.10
width of pronotum	2.39 – 2.95	2.68	0.30	0.14
width of elytra	3.10 – 3.99	3.52	0.48	0.23
length of elytra	4.24 – 5.32	4.68	0.55	0.26
width of head	1.46 – 1.83	1.61	0.19	0.09
width of frons	0.81 – 1.09	0.92	0.14	0.06
length of rostrum	1.33 – 1.86	1.55	0.25	0.12
length of scape	1.21 – 1.58	1.41	0.17	0.08

Table 6. Descriptive statistics for *Panscopus costatus* based on seven females from throughout the range of the species.

Measurement, in mm	Range	Mean	1.5SD	2SE
length overall	7.27 – 7.79 (n=5)*	7.61	0.30	0.18
length of pronotum	1.83 – 1.98 (n=7)	1.92	0.09	0.04
width of pronotum	2.11 – 2.26 "	2.17	0.08	0.04
width of elytra	3.29 – 3.61 "	3.46	0.19	0.09
length of elytra	4.11 – 4.49 "	4.33	0.19	0.10
width of head	1.30 – 1.36 "	1.33	0.04	0.02
width of frons	0.78 – 0.84 "	0.81	0.05	0.02
length of rostrum	1.33 – 1.49 "	1.41	0.10	0.05
length of scape	1.12 – 1.24 "	1.17	0.07	0.03

* Two individuals had their heads detached, so overall length was not measured for those specimens.

Table 7. Descriptive statistics for *Panscopus capizzii* based on one male and one female from Van Duzen River nr. Carlotta, CA, and Bullrun Flat, nr Garberville, CA, respectively.

Measurement, in mm	Range	Mean	1.5SD	2SE
Male				
length overall	6.10	—	—	—
length of pronotum	1.55	—	—	—
width of pronotum	1.74	—	—	—
width of elytra	2.91	—	—	—
length of elytra	3.61	—	—	—
width of head	1.12	—	—	—
width of frons	0.65	—	—	—
length of rostrum	1.21	—	—	—
length of scape	0.99	—	—	—
Female				
length overall	5.8*	—	—	—
length of pronotum	1.49	—	—	—
width of pronotum	1.67	—	—	—
width of elytra	2.53	—	—	—
length of elytra	3.10	—	—	—
width of head	1.02	—	—	—
width of frons	0.59	—	—	—
length of rostrum	1.27	—	—	—
length of scape	0.99	—	—	—

* Estimated from a specimen with head detached.

Table 8. Descriptive statistics for *Panscopus convergens* based on twelve males and twelve females from Marshfield, Coos Co., OR.

Measurement, in mm	Range	Mean	1.5SD	2SE
Males				
length overall	5.58 – 6.88	6.18	0.49	0.19
length of pronotum	1.58 – 1.83	1.68	0.12	0.05
width of pronotum	1.58 – 1.86	1.71	0.12	0.05
width of elytra	2.09 – 2.53	2.27	0.17	0.07
length of elytra	3.29 – 3.99	3.58	0.30	0.11
width of head	1.05 – 1.21	1.14	0.06	0.02
width of frons	0.56 – 0.65	0.59	0.04	0.02
length of rostrum	1.05 – 1.30	1.17	0.09	0.04
length of scape	1.02 – 1.21	1.12	0.08	0.03
Females				
length overall	6.36 – 7.53	6.92	0.61	0.24
length of pronotum	1.61 – 1.92	1.81	0.18	0.07
width of pronotum	1.71 – 2.11	1.94	0.20	0.08
width of elytra	2.53 – 3.16	2.85	0.30	0.12
length of elytra	3.54 – 4.18	3.91	0.34	0.13
width of head	1.09 – 1.36	1.26	0.13	0.05
width of frons	0.59 – 0.74	0.66	0.07	0.03
length of rostrum	1.12 – 1.33	1.23	0.11	0.04
length of scape	1.05 – 1.30	0.19	0.10	0.04

Table 9. Descriptive statistics for *Panscopus oregonensis* based on one male from Forest Grove, Washington Co., OR.

Measurement, in mm	Range	Mean	1.5SD	2SE
length overall	8.7	—	—	—
length of pronotum	2.51	—	—	—
width of pronotum	2.48	—	—	—
width of elytra	2.97	—	—	—
length of elytra	5.19	—	—	—
width of head	1.46	—	—	—
width of frons	0.74	—	—	—
length of rostrum	1.55	—	—	—
length of scape	1.58	—	—	—

Table 10. Descriptive statistics for *Panscopus gemmatus* based on ten males and ten females from the Queets River forest, Jefferson Co., WA.

Measurement, in mm	Range	Mean	1.5SD	2SE
Males				
length overall	8.70 – 10.91	9.78	0.96	0.41
length of pronotum	2.11 – 2.57	2.35	0.24	0.10
width of pronotum	2.23 – 2.79	2.49	0.26	0.11
width of elytra	2.97 – 3.73	3.32	0.36	0.15
length of elytra	4.68 – 6.33	5.39	0.74	0.31
width of head	1.36 – 1.71	1.59	0.15	0.06
width of frons	0.62 – 0.78	0.70	0.09	0.04
length of rostrum	1.77 – 2.17	1.95	0.15	0.06
length of scape	1.55 – 1.92	1.69	0.16	0.07
Females				
length overall	8.31 – 11.17	10.08	1.20	0.51
length of pronotum	1.95 – 2.48	2.29	0.23	0.10
width of pronotum	2.20 – 2.76	2.56	0.23	0.10
width of elytra	3.29 – 4.24	3.92	0.40	0.17
length of elytra	4.68 – 6.20	5.56	0.61	0.26
width of head	1.43 – 1.80	1.63	0.15	0.06
width of frons	0.62 – 0.81	0.73	0.08	0.03
length of rostrum	1.61 – 2.11	1.92	0.21	0.09
length of scape	1.36 – 1.80	1.64	0.19	0.04

Table 11. Host plant records for *Panscopus gemmatus* (LeConte)

Taxon	Label data	number	Total for species	Total for genus
GYMNOSPERMAE:				
PINACEAE:				
Tsuga heterophylla			13	13
	CAN:BC:Clayoquot Arm,1.Aug.51,F.I.S.	(1)		
	CAN:BC:Engelwood,31.Aug.51,F.I.S.	(1)		
	CAN:BC:Juskatla, 7.Jul.59, F.I.S.	(1)		
	CAN:BC:Port Hardy,Vancouver Isl.,30.May.48,J. O. Little	(5)		
	CAN:BC:Port Renfrew, 1&2Jun.49, F.I.S.	(1)		
	USA:WA:Hoquiam, 13May&29.Apr.04,26.May.05, Burke	(4)		
Picea sitchensis			1	1
	USA:OR:Klanawa River, 2.Aug.48, J.M.Kinghorn	(1)		
Pinus sp.				1
	USA:OR:Newport, 24.May.67, Brown&Goeden		(1)	
ANGIOSPERMAE:				
ROSACEAE:				
Rubus parviflorus Nutt.			47	54
	CAN:BC:Q.C.Is.,Mosquito Lk Cpgd, 4.Jul.84,R.S.Anderson	(11)		
	USA:OR:Cornelius Pass,nr. Portland,18.Jun.68,K.Goeden	(1)		
	USA:OR;Horsetail Falls, nr Portland,19.Apr.67, K. Goeden	(3)		
	USA:WA:Olympic N.P.,25.Jun.87, Spanton&Brown	(24)		
Rubus sp.				
	USA:OR:Gresham,26.Apr.45,Joe Schuh	(7)		
Oemleria cerasiformis (H. & A.) Landon			2	2
	USA:OR:Portland,11.May.55, V. Roth	(2)		
Prunus sp.			1	1
	USA:WA:Ocosta, 26.May.44, GMH, GFP	(1)		
Pyrus sp.			2	2
	USA:OR:Stayton, 7.May.62, F. Beck	(2)		
ACERACEAE:				
Acer macrophyllum Pursh			11	17
	USA:OR:Niagara Park, 23.Apr.72, R.L.Westcott	(1)		
	USA:OR:Portland, 9.May.41, Schuh&Gray	(10)		
Acer circinatum Pursh			6	
	USA:WA:Doty, 22&23.Aug.70, R.L.Westcott	(5)		
	USA:WA:Hoquiam, ?, Burke	(1)		
ERICACEAE:				
Menziesia sp.				2
	CAN:BC:QCI:Graham Is. Rennel Snd,8.Jul.84,R.S.Anderson		(2)	
Gaultheria shallon Pursh Salal.			1	1
	USA:OR:Nehalem, 5mi N.,14.Aug.61,D.R.Smith	(1)		
Vaccinium sp. Huckleberry			5	5
	USA:WA:Hoquiam, 27&29.Apr.04, Burke	(5)		

Table 12. Descriptive statistics for *Panscopus longiscapus* based on ten males and ten females from Olympia, Thurston Co., WA.

Measurement, in mm	Range	Mean	1.5SD	2SE
Males				
length overall	7.66 – 9.35	8.44	0.77	0.33
length of pronotum	2.20 – 2.67	2.34	0.21	0.09
width of pronotum	2.42 – 2.88	2.62	0.20	0.09
width of elytra	3.04 – 3.61	3.25	0.25	0.11
length of elytra	4.11 – 5.25	4.74	0.52	0.22
width of head	1.43 – 1.64	1.49	0.10	0.04
width of frons	0.62 – 0.74	0.67	0.05	0.02
length of rostrum	1.46 – 1.64	1.55	0.11	0.04
length of scape	1.55 – 1.80	1.64	0.13	0.06
Females				
length overall	8.05 – 9.87	8.79	0.90	0.38
length of pronotum	2.11 – 2.51	2.31	0.21	0.09
width of pronotum	2.42 – 2.88	2.69	0.24	0.10
width of elytra	3.35 – 4.05	3.64	0.33	0.14
length of elytra	4.18 – 5.19	4.82	0.45	0.19
width of head	1.43 – 1.61	1.53	0.10	0.04
width of frons	0.65 – 0.78	0.73	0.05	0.02
length of rostrum	1.43 – 1.61	1.51	0.10	0.04
length of scape	1.40 – 1.67	1.55	0.14	0.06

Table 13. Descriptive statistics for *Panscopus squamosus* based on ten males and ten females from Tollgate, Blue Mtns, Umatilla Co. OR.

Measurement, in mm	Range	Mean	1.5SD	2SE
Males				
length overall	5.32 – 7.01	5.90	0.70	0.30
length of pronotum	1.36 – 1.71	1.54	0.18	0.07
width of pronotum	1.61 – 2.05	1.79	0.19	0.08
width of elytra	2.09 – 2.59	2.29	0.25	0.11
length of elytra	2.85 – 3.45	3.18	0.33	0.14
width of head	0.96 – 1.18	1.05	0.10	0.04
width of frons	0.47 – 0.62	0.53	0.07	0.03
length of rostrum	0.99 – 1.21	1.11	0.10	0.04
length of scape	0.93 – 1.18	1.09	0.13	0.05
Females				
length overall	5.32 – 6.88	6.27	0.67	0.28
length of pronotum	1.46 – 1.83	1.62	0.16	0.07
width of pronotum	1.77 – 2.17	1.95	0.25	0.09
width of elytra	2.66 – 3.23	2.85	0.29	0.12
length of elytra	3.35 – 4.1	3.70	0.38	0.16
width of head	1.02 – 1.30	1.17	0.13	0.05
width of frons	0.54 – 0.71	0.63	0.08	0.03
length of rostrum	1.02 – 1.24	1.15	0.13	0.05
length of scape	0.93 – 1.21	1.07	0.14	0.06

Table 14. Descriptive statistics for *Panscopus michelbacheri* based on ten males and ten females from Nevada City, CA (paratype series, in part).

Measurement, in mm	Range	Mean	1.5SD	2SE
Males				
length overall	7.79 – 9.74	8.48	0.83	0.35
length of pronotum	2.02 – 2.42	2.22	0.20	0.08
width of pronotum	2.20 – 2.64	2.44	0.21	0.09
width of elytra	2.91 – 3.54	3.19	0.30	0.13
length of elytra	4.49 – 5.44	4.86	0.43	0.18
width of head	1.27 – 1.55	1.45	0.13	0.05
width of frons	0.62 – 0.78	0.68	0.07	0.03
length of rostrum	1.43 – 1.74	1.60	0.13	0.06
length of scape	1.52 – 1.89	1.71	0.17	0.07
Females				
length overall	8.83 – 9.61	9.15	0.49	0.21
length of pronotum	2.11 – 2.42	2.22	0.13	0.05
width of pronotum	2.51 – 2.91	2.65	0.17	0.07
width of elytra	3.32 – 4.49	4.00	0.47	0.20
length of elytra	5.13 – 6.14	5.47	0.47	0.20
width of head	1.55 – 1.74	1.62	0.08	0.03
width of frons	0.74 – 0.87	0.80	0.07	0.03
length of rostrum	1.58 – 1.80	1.69	0.11	0.05
length of scape	1.55 – 1.77	1.67	0.11	0.05

Table 15. Descriptive statistics for *Panscopus johnsoni* based on seven males and one female from Humptulips, Grays Harbor Co., WA (paratype series).

Measurement, in mm	Range	Mean	1.5SD	2SE
Males				
length overall	6.36 – 7.27 (n=6)*	6.79	0.49	0.27
length of pronotum	1.46 – 1.64 (n=7)	1.56	0.08	0.04
width of pronotum	1.61 – 1.74 "	1.68	0.06	0.03
width of elytra	2.28 – 2.53 "	2.41	0.12	0.06
length of elytra	3.54 – 4.05 "	3.82	0.27	0.14
width of head	1.09 – 1.18 "	1.12	0.05	0.02
width of frons	0.47 – 0.53 "	0.50	0.03	0.02
length of rostrum	1.30 – 1.36 "	1.34	0.03	0.02
length of scape	1.05 – 1.15 "	1.11	0.06	0.03
Females				
length overall	6.62	—	—	—
length of pronotum	1.46	—	—	—
width of pronotum	1.55	—	—	—
width of elytra	2.69	—	—	—
length of elytra	3.80	—	—	—
width of head	1.07	—	—	—
width of frons	0.48	—	—	—
length of rostrum	1.18	—	—	—
length of scape	0.96	—	—	—

* One specimen had its head detached so overall length was not measured for that individual.

Table 16. Descriptive statistics for *Panscopus bakeri* based on ten males and ten females from Electron, Pierce Co., Washington (paratype material).

Measurement, in mm	Range	Mean	1.5SD	2SE
Males				
length overall	5.97 – 7.27	6.58	0.67	0.28
length of pronotum	1.55 – 1.84	1.67	0.13	0.06
width of pronotum	1.77 – 2.05	1.93	0.12	0.05
width of elytra	2.41 – 3.10	2.63	0.29	0.12
length of elytra	3.42 – 3.99	3.74	0.28	0.12
width of head	1.12 – 1.27	1.20	0.08	0.03
width of frons	0.57 – 0.65	0.60	0.03	0.01
length of rostrum	1.27 – 1.36	1.32	0.04	0.02
length of scape	0.99 – 1.19	1.11	0.09	0.04
Females				
length overall	6.97 – 8.57	7.56	0.71	0.30
length of pronotum	1.61 – 1.98	1.80	0.17	0.07
width of pronotum	2.02 – 2.29	2.14	0.14	0.06
width of elytra	3.10 – 3.61	3.26	0.23	0.10
length of elytra	4.05 – 4.81	4.30	0.34	0.14
width of head	1.24 – 1.36	1.31	0.07	0.03
width of frons	0.62 – 0.73	0.67	0.05	0.02
length of rostrum	1.33 – 1.58	1.41	0.11	0.05
length of scape	1.02 – 1.27	1.14	0.10	0.04

Table 17. Descriptive statistics for *Panscopus longus* based on one male and two females from Peshastin, WA.

Measurement, in mm	Range	Mean	1.5SD	2SE
Male				
length overall	8.83	—	—	—
length of pronotum	2.20	—	—	—
width of pronotum	2.36	—	—	—
width of elytra	3.10	—	—	—
length of elytra	5.13	—	—	—
width of head	1.49	—	—	—
width of frons	0.78	—	—	—
length of rostrum	1.77	—	—	—
length of scape	1.46	—	—	—
Females				
length overall	10.26*	—	—	—
length of pronotum	2.26 – 2.33	2.30	—	—
width of pronotum	2.54 – 2.60	2.57	—	—
width of elytra	3.80 – 3.92	3.86	—	—
length of elytra	5.89 – 5.89	5.89	—	—
width of head	1.61 – 1.61	1.61	—	—
width of frons	0.84 – 0.87	0.86	—	—
length of rostrum	1.83 – 1.89	1.86	—	—
length of scape	1.36 – 1.52	1.44	—	—

* One of two female specimens had the head detached, so an overall length measurement was taken for only one specimen.

Table 18. Descriptive statistics for *Panscopus torpidus* based on ten males and ten females from Granite, Bonner Co., ID.

Measurement, in mm	Range	Mean	1.5SD	2SE
Males				
length overall	5.71 – 6.69	6.23	0.50	0.21
length of pronotum	1.46 – 1.71	1.59	0.12	0.05
width of pronotum	1.64 – 1.89	1.79	0.12	0.05
width of elytra	2.22 – 1.59	2.44	0.18	0.08
length of elytra	3.29 – 3.67	3.50	0.18	0.07
width of head	1.09 – 1.21	1.16	0.07	0.03
width of frons	0.59 – 0.68	0.64	0.05	0.02
length of rostrum	1.19 – 1.40	1.31	0.10	0.04
length of scape	0.93 – 1.05	1.00	0.07	0.03
Females				
length overall	6.23 – 7.14	6.71	0.45	0.19
length of pronotum	1.49 – 1.77	1.66	0.13	0.05
width of pronotum	1.77 – 2.17	1.98	0.18	0.08
width of elytra	2.75 – 3.10	2.98	0.18	0.07
length of elytra	3.54 – 4.24	3.88	0.34	0.14
width of head	1.16 – 1.36	1.27	0.09	0.04
width of frons	0.65 – 0.74	0.69	0.05	0.02
length of rostrum	1.27 – 1.43	1.35	0.08	0.03
length of scape	0.93 – 1.05	1.00	0.06	0.03

Table 19. Descriptive statistics for *Panscopus ovalis* based on five males from Laird Park, and Deep Saddle, ID, and eight females from Edmonton, AB.

Measurement, in mm	Range	Mean	1.5SD	2SE
Males				
length overall	6.10 – 6.75	6.42	0.49	0.29
length of pronotum	1.43 – 1.67	1.55	0.15	0.09
width of pronotum	1.64 – 1.95	1.79	0.21	0.13
width of elytra	2.28 – 2.69	2.49	0.23	0.14
length of elytra	3.16 – 3.99	3.51	0.51	0.30
width of head	1.02 – 1.21	1.11	0.11	0.07
width of frons	0.50 – 0.60	0.55	0.07	0.04
length of rostrum	1.27 – 1.46	1.39	0.12	0.07
length of scape	0.96 – 1.13	1.05	0.11	0.07
Females				
length overall	6.47 – 7.53	6.99	0.50	0.24
length of pronotum	1.58 – 1.77	1.69	0.12	0.05
width of pronotum	1.98 – 2.29	2.12	0.16	0.07
width of elytra	2.85 – 3.35	3.10	0.26	0.12
length of elytra	3.67 – 4.56	4.16	0.48	0.23
width of head	1.24 – 1.40	1.29	0.09	0.04
width of frons	0.65 – 0.74	0.70	0.05	0.02
length of rostrum	1.27 – 1.43	1.35	0.09	0.04
length of scape	0.96 – 1.12	1.02	0.08	0.04

Table 20. Descriptive statistics for *Panscopus tricarinatus* based on ten males and ten females from the vicinity of Mt. Hood, OR.

Measurement, in mm	Range	Mean	1.5SD	2SE
Males				
length overall	5.26 – 6.30	5.80	0.60	0.25
length of pronotum	1.40 – 1.61	1.49	0.12	0.05
width of pronotum	1.49 – 1.74	1.65	0.12	0.05
width of elytra	2.09 – 2.44	2.27	0.20	0.08
length of elytra	3.29 – 3.73	3.49	0.22	0.09
width of head	0.99 – 1.09	1.04	0.05	0.02
width of frons	0.50 – 0.56	0.53	0.04	0.02
length of rostrum	1.18 – 1.33	1.24	0.08	0.03
length of scape	0.85 – 1.01	0.94	0.08	0.03
Females				
length overall	5.54 – 6.49	6.10	0.49	0.21
length of pronotum	1.40 – 1.61	1.49	0.10	0.04
width of pronotum	1.63 – 1.86	1.75	0.10	0.04
width of elytra	2.44 – 2.78	2.57	0.16	0.07
length of elytra	3.16 – 3.73	3.56	0.28	0.12
width of head	1.01 – 1.18	1.08	0.07	0.03
width of frons	0.53 – 0.60	0.56	0.04	0.02
length of rostrum	1.09 – 1.30	1.23	0.09	0.04
length of scape	0.81 – 0.96	0.90	0.06	0.03

Table 21. Descriptive statistics for *Panscopus bufo* based on seven males from various locations in east-central and northern CA, and twelve females from the Sonora Pass vicinity, Mono Co., CA.

Measurement, in mm	Range	Mean	1.5SD	2SE
Males				
length overall	6.10 – 6.75	6.46	0.36	0.18
length of pronotum	1.43 – 1.60	1.54	0.09	0.05
width of pronotum	1.53 – 1.78	1.71	0.14	0.07
width of elytra	2.09 – 2.53	2.37	0.21	0.11
length of elytra	3.10 – 3.80	3.51	0.31	0.16
width of head	1.02 – 1.15	1.11	0.08	0.04
width of frons	0.51 – 0.60	0.56	0.05	0.03
length of rostrum	1.18 – 1.40	1.30	0.10	0.05
length of scape	0.90 – 1.12	1.03	0.11	0.05
Females				
length overall	5.65 – 6.95	6.16	0.58	0.22
length of pronotum	1.43 – 1.77	1.57	0.16	0.06
width of pronotum	1.67 – 2.02	1.81	0.18	0.07
width of elytra	2.53 – 3.04	2.78	0.28	0.11
length of elytra	2.91 – 4.05	3.57	0.44	0.17
width of head	1.09 – 1.30	1.19	0.10	0.04
width of frons	0.56 – 0.68	0.61	0.05	0.02
length of rostrum	1.12 – 1.36	1.25	0.14	0.05
length of scape	0.90 – 1.09	0.98	0.09	0.04

Table 22. Descriptive statistics for *Panscopus schwarzi* based on ten males and ten females from Utah Co., UT.

Measurement, in mm	Range	Mean	1.5SD	2SE
Males				
length overall	5.84 – 6.75	6.36	0.43	0.18
length of pronotum	1.50 – 1.74	1.62	0.11	0.05
width of pronotum	1.75 – 1.95	1.83	0.11	0.05
width of elytra	2.22 – 2.66	2.38	0.20	0.08
length of elytra	3.35 – 3.99	3.72	0.28	0.12
width of head	1.12 – 1.18	1.15	0.03	0.01
width of frons	0.59 – 0.65	0.62	0.03	0.01
length of rostrum	1.21 – 1.33	1.27	0.06	0.03
length of scape	0.87 – 1.05	0.98	0.08	0.03
Females				
length overall	5.78 – 7.53	6.71	0.78	0.33
length of pronotum	1.50 – 1.89	1.67	0.19	0.08
width of pronotum	1.83 – 2.23	1.99	0.20	0.08
width of elytra	2.59 – 3.10	2.79	0.24	0.10
length of elytra	3.61 – 4.49	3.97	0.43	0.18
width of head	1.16 – 1.36	1.25	0.10	0.04
width of frons	0.62 – 0.71	0.66	0.05	0.02
length of rostrum	1.27 – 1.49	1.35	0.11	0.05
length of scape	0.87 – 1.07	0.97	0.09	0.04

Table 23. Descriptive statistics for *Panscopus coloradensis* based on one male from the White Mtns, AZ, and ten females from Cumbres Pass, CO.

Measurement, in mm	Range	Mean	1.5SD	2SE
Males				
length overall	6.36	—	—	—
length of pronotum	1.43	—	—	—
width of pronotum	1.83	—	—	—
width of elytra	2.34	—	—	—
length of elytra	3.67	—	—	—
width of head	1.12	—	—	—
width of frons	0.56	—	—	—
length of rostrum	1.18	—	—	—
length of scape	0.87	—	—	—
Females				
length overall	6.36 – 7.40	6.81	0.51	0.22
length of pronotum	1.43 – 1.61	1.49	0.08	0.04
width of pronotum	1.83 – 2.11	1.97	0.13	0.05
width of elytra	2.53 – 3.10	2.84	0.26	0.11
length of elytra	3.48 – 4.18	3.91	0.36	0.15
width of head	1.21 – 1.36	1.28	0.09	0.04
width of frons	0.59 – 0.68	0.64	0.05	0.02
length of rostrum	1.18 – 1.40	1.29	0.12	0.05
length of scape	0.87 – 1.02	0.94	0.07	0.03

Table 24. Descriptive statistics for *Panscopus squamifrons* based on eight males and seven females from Upper Klamath Lake, OR.

Measurement, in mm	Range	Mean	1.5SD	2SE
Males				
length overall	5.58 – 6.30	5.90	0.42	0.20
length of pronotum	1.43 – 1.61	1.52	0.10	0.05
width of pronotum	1.52 – 1.71	1.59	0.10	0.05
width of elytra	2.09 – 2.34	2.21	0.12	0.06
length of elytra	2.97 – 3.48	3.25	0.27	0.13
width of head	0.99 – 1.16	1.10	0.08	0.04
width of frons	0.59 – 0.70	0.62	0.05	0.02
length of rostrum	1.05 – 1.21	1.12	0.08	0.04
length of scape	0.88 – 1.02	0.96	0.06	0.03
Females				
length overall	5.19 – 6.04	5.67	0.53	0.27
length of pronotum	1.33 – 1.64	1.53	0.18	0.09
width of pronotum	1.55 – 1.80	1.68	0.16	0.08
width of elytra	2.15 – 2.59	2.39	0.25	0.12
length of elytra	2.91 – 3.67	3.28	0.39	0.20
width of head	1.05 – 1.21	1.14	0.09	0.05
width of frons	0.57 – 0.70	0.64	0.08	0.04
length of rostrum	1.09 – 1.18	1.14	0.06	0.03
length of scape	0.85 – 0.99	0.93	0.09	0.05

Table 25. Descriptive statistics for *Panscopus aequalis* based on ten females from Medicine Hat, AB.

Measurement, in mm	Range	Mean	1.5SD	2SE
Males				
length overall	6.62 – 8.70	7.29	1.02	0.43
length of pronotum	1.49 – 1.95	1.72	0.23	0.10
width of pronotum	1.80 – 2.26	1.99	0.24	0.10
width of elytra	2.59 – 3.48	3.01	0.43	0.18
length of elytra	3.73 – 4.81	4.22	0.59	0.25
width of head	1.21 – 1.47	1.33	0.14	0.06
width of frons	0.59 – 0.78	0.68	0.09	0.04
length of rostrum	1.18 – 1.58	1.34	0.18	0.08
length of scape	0.93 – 1.15	1.03	0.12	0.05

Table 26. Descriptive statistics for *Panscopus abruptus* based on ten males and ten females from Amador Co., CA.

Measurement, in mm	Range	Mean	1.5SD	2SE
Males				
length overall	6.88 – 8.44	7.39	0.71	0.30
length of pronotum	1.63 – 1.95	1.80	0.16	0.07
width of pronotum	1.77 – 2.11	1.92	0.17	0.07
width of elytra	2.47 – 2.91	2.64	0.21	0.09
length of elytra	3.80 – 4.30	4.00	0.29	0.12
width of head	1.18 – 1.30	1.22	0.07	0.03
width of frons	0.62 – 0.78	0.67	0.07	0.03
length of rostrum	1.35 – 1.61	1.48	0.13	0.05
length of scape	1.05 – 1.21	0.14	0.10	0.04
Females				
length overall	7.40 – 9.74	8.25	1.15	0.48
length of pronotum	1.75 – 2.29	1.90	0.30	0.12
width of pronotum	2.05 – 2.48	2.18	0.25	0.11
width of elytra	2.85 – 3.61	3.16	0.39	0.16
length of elytra	4.18 – 5.32	4.59	0.62	0.26
width of head	1.27 – 1.55	1.36	0.16	0.07
width of frons	0.68 – 0.84	0.74	0.07	0.03
length of rostrum	1.40 – 1.77	1.57	0.20	0.08
length of scape	1.05 – 1.36	1.19	0.16	0.07

Table 27. Descriptive statistics for *Panscopus rugicollis* based on ten females from Sunrise Peak, Rainier Nat'l. Park, WA.

Measurement, in mm	Range	Mean	1.5SD	2SE
length overall	7.40 – 9.03	8.30	0.83	0.35
length of pronotum	1.74 – 2.05	1.88	0.17	0.07
width of pronotum	2.02 – 2.33	2.23	0.16	0.07
width of elytra	2.85 – 3.39	3.15	0.26	0.11
length of elytra	4.05 – 5.00	4.63	0.39	0.17
width of head	1.30 – 1.49	1.41	0.08	0.03
width of frons	0.71 – 0.82	0.76	0.04	0.02
length of rostrum	1.36 – 1.67	1.55	0.14	0.06
length of scape	1.09 – 1.27	1.18	0.10	0.04

Table 28. Character states exhibited by exemplars of tribes of Entiminae

Taxon\Char.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Lordopini	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Ophryastini	1	2	1	1	1	1	1	1	1	1	1	1	2	2	1	1	0	0	0	0	0	0	0	1	1	1	?	0	0
Entimini	1	2	1	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Promecopini	1	3	2	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	?	?	?	0	?	0	0	0	1	0
Leptopiini	1	1 2 3	0 1 2	0 1	0 1 2	1	0 1	0 1	1	0 1	1	1	1	2	0	0 1	0 1	1 2	1	0 1	0 1	0 1	0 1 2 3	1 2	0 1	1	0 2 4	1 2	0 1 2
Premnotrypini	1	2	0	1	0 2	1	1	1	1	1	1	1	1	2	0	0	1	2	1	1	1	1	1	0	0	0	3	0	1
Leptostethini	1	2	0	1	0 2	1	1	1	1	1	1	1	1	2	1	1	0	0	0	0	0	0	0	0	0	0	4	0	0 2

Table 29 . Character states for genera of Leptopiini occuring in North and Central America

Taxon \ Char.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Phyxelis	1	0	2	0	1	1	0	0	0	0	2	1	1	1	2
Lepidophorus	1	1	2	1	0	0	0	0	0	0	0	1	0	1	2
Rhigopsis	2	3	2	1	1	1	1	2	1	1	2	1	1	0	0
Dirotognathus	2	0	2	1	0	1	1	0	0	0	2	1	1	0	2
Cimbocera	1	0	1	1	0	0	0	2	0	0	0	1	0	0	2
Paracimbocera	0	0	1	1	0	0	0	1	0	0	0	1	0	1	2
Miloderes	2	2	1	1	0	0	1	1	0	0	1	1	0	1	1
Plinthodes	2	3	1	1	0	0	0	0	0	1	0	1	1	0	1
Tryglyphulus	1	3	1	1	0	1	0	0	0	1	0	1	0	0	1
Acmaegenius	2	3	1	1	0	0	0	0	0	1	0	1	1	0	1
Trichalophus	2	3	1	1	0	0	0	0	0	0	0	1	0	0	1
Adaleres	2	3	1	1	0	0	0	0	1	0	0	0	1	1	2
Lepesoma	1	1	0	0	0	0	0	0	1	0	0	0	0	1	2
Amphidees	1&2	0	0	0	0	0	0	0	0	0	2	1	1	1	2
Crocidema	1	1	1	1	0	0	0	0	0	0	2	0	0	1	2
Tropiphorus	2	0	1	1	2	1	0	0	1	0	2	1	1	1	0
Pseudorhimus	0	0	1	0	0	0	0	0	0	0	2	0	0	1	2
Orimodema	1	0	1	1	0	0	0	0	0	0	2	0	0	1	1
Melanolemma	1	3	1	0	0	0	0	0	0	0	2	1	0	1	2
Connatichela	?	0	1	0	1	0	0	0	0	0	2	1	0	1	0
Diamimus	1	0	1	0	0	0	0	0	0	0	2	0	0	1	2
Panscopus	1&2	0&2&3	1	1	0	0	0	0	1	0&1	1&2	0	1	1	2
Leptopinara	1	2	1	1	1	0	0	0	0	1	2	0	1	1	2
Paranametis	1	2	0	0	0	0	0	0	0	1	2	0	1	0	2
Anametis	1	2	0	0	0	0	0	0	0	0	2	0	1	1	1
Peritaxia	1	1	1	0	1	0	0	0	0	0	1&2	0	1	1	1
Dichoxenus	1	3	0	0	0	0	0	0	0	0	2	0	1	1	0
Ophryastes	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0

Table 29 (cont'd). Character states for genera of Leptopiini occurring in North and Central America

Taxon \ Char.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Phyxelis	1	3	0	1	2	0	0	0	0	1	1	0	1	0	0
Lepidophorus	1	1	0	1	2	0	0	0	1	1	1	0&1	1	0	0
Rhigopsis	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dirotognathus	1	2	1	1	2	0	0	0	0	1	1	0	1	1	0
Cimbocera	1	3	0	0	0	0	0	0	0	0	1	0	1	0	0
Paracimbocera	1	3	1	0	0	0	0	0	0	0	1	0	1	0	0
Miloderes	1	1&2&3	1	0	1	0	0	0	0	0	0	0	1	1	1
Plinthodes	3	4	1	1	0	0	0	1	1	1	1	0	0	0	0
Tryglyphulus	1	4	2	1	0	1	0	1	1	1	1	0	0	0	0
Acmaegenius	1	4	2	1	0	0	0	1	1	1	1	1	0	0	0
Trichalophus	3	4	2	1	0	0	0	1	1	1	0	0	0	0	0
Adaleres	1	2	1	1	1	1	1	0	0	0	0	0	0	0	0
Lepesoma	1	0&1	0	1	1	0	1	0	0	1	1	0	1	0	0
Amphidees	3	3	0	1	1	0	0	0	0&1	1	0	0	1	0	0
Crocidema	1	0	1	1	1	0	0	0	1	1	1	0	1	0	0
Tropiphorus	0&1	3	1	1	2	0	1	0	1	1	1	0&1	1	0	0
Pseudorhimus	1	0	1	1	1	0	0	0	1	1	1	0	1	1	0
Orimodema	1	1	1	1	1	0	0	0	0	1	0	0	1	0	0
Melanolemma	1	0&1	1	1	1	0	0	0	1	1	0	0	1	1	0
Connatichela	1	2	0	1	0	0	0	0	0	1	0	0	1	0	0
Diamimus	1	1&2	1	1	1	0	0	0	0	0	1	0	1	0	0
Panscopus	2&3	3&4	0	1	1	0	2	0	0	1	1	0&1&2	1	0	0
Leptopinara	1	2	0	1	1	0	0	0	0	1	1	0	1	1	0
Paranametis	1	3	0	1	1	0	0	0	0	1	0	0	1	0	0
Anametis	1	2	0	1	1	0	0	0	0	1	1	0	1	0	0
Peritaxia	1	1	0	1	1	0	0	0	1	1	0	0	1	1	1
Dichoxenus	2	3	0	0&1	1	0	0	0	0	1	0	0	1	0	0
Ophryastes	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 29 (cont'd). Character states for genera of Leptopiini occurring in North and Central America

Taxon \ Char.	31	32	33	34	35	36	37	38	39	40	41	42	43
Phyxelis	1	0	1	2	0	0	3	0	0	0	1	1	1
Lepidophorus	1	0	0	0	1	0	0	0	0	0	0	0	0
Rhigopsis	0	0	0	0	0	0	0	0	0	0	0	0	0
Dirotognathus	1	0	0	0	1	1	0	0	0	0	0	0	0
Cimbocera	1	1	1	2	0	0	0	0	0	0	0	0	0
Paracimbocera	1	1	1	1	0	0	0	0	0	0	0	0	0
Miloderes	0	0	0	0	0	0	3	0	0	0	0	0	0
Plinthodes	0	0	0	0	0	0	0	0	0	0	0	0	0
Tryglyphulus	0	0	0	0	0	0	0	0	0	0	0	0	0
Acmaegenius	0	0	0	0	0	0	0	0	0	0	0	0	0
Trichalophus	0	0	0	0	0	0	2	0	0	0	0	0	0
Adaleres	0	0	0	0	0	0	0	0	0	0	0	0	0
Lepesoma	1	0	0	0	0	0	1	0	0	0	1	1	1
Amphidees	1	0	0	0	0	0	0	0	0	0	1	1	1
Crocidema	1	0	0	0	0	0	0	1	0	0	0	0	0
Tropiphorus	1	0	1	0	0	0	3	0	1	0	1	1	1
Pseudorhimus	1	0	0	0	0	0	0	0	0	0	0	0	0
Orimodema	1	0	0	1	0	1	0	1	0	0	0	0	0
Melanolemma	0	0	0	1	0	1	0	0	0	0	0	0	0
Connatichela	0	0	1	1	0	0	?	0	1	0	0	0	0
Diamimus	1	0	0	0	0	0	0	0	0	0	0	0	0
Panscopus	1	0	0	0	0	0	2	0	0	0&1	0	0	0
Leptopinara	1	0	1	0	0	0	0	0	0	0	0	0	0
Paranametis	0	0	0	0	0	0	0	0	0	0	1	1	1
Anametis	1	0	0	0	0	0	3	0	0	0	0	0	0
Peritaxia	0	0	0	0	0	0	0	0	0	0	0	0	0
Dichoxenus	0	0	0	0	0	0	0	0	0	0	0	0	0
Ophryastes	0	0	0	0	0	0	0	0	0	0	0	0	0

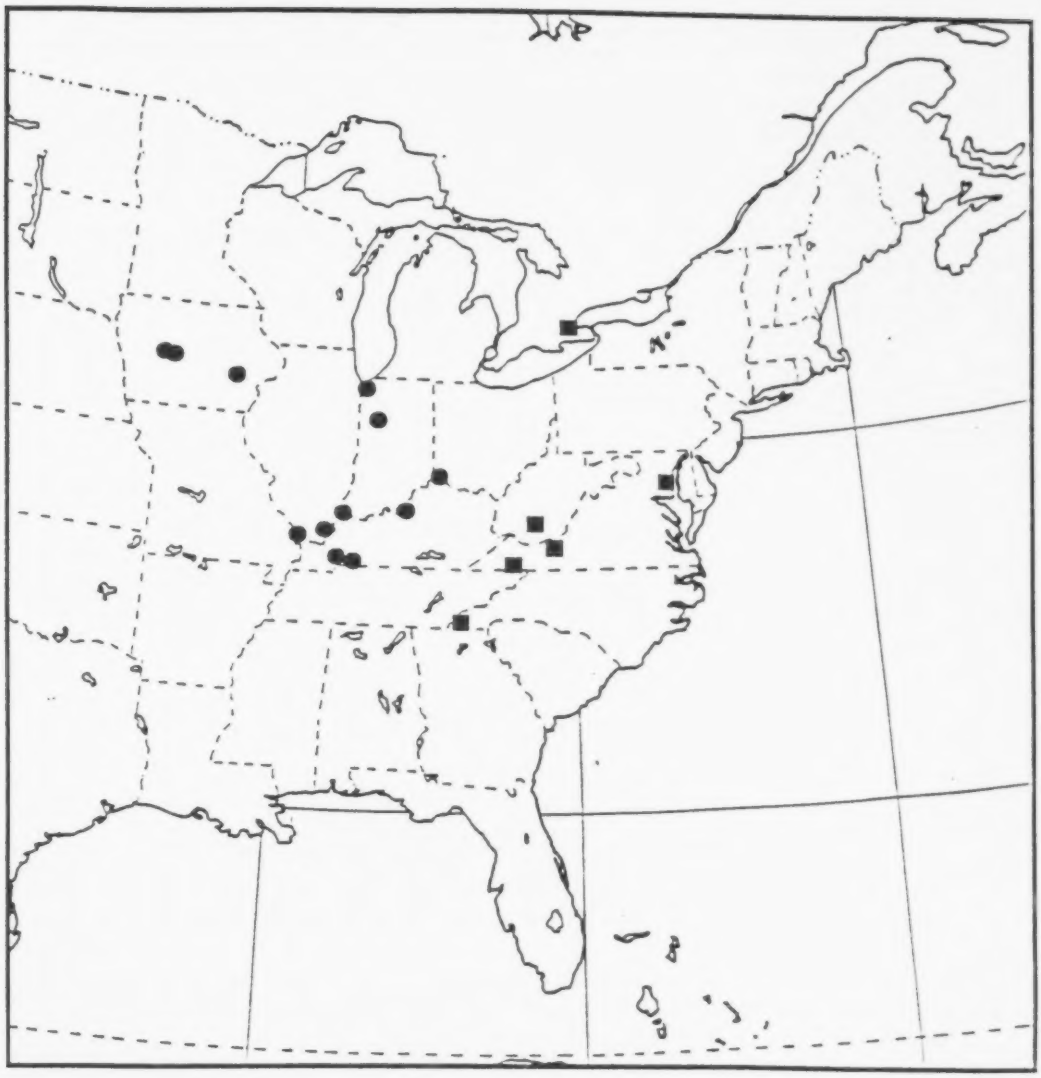
Table 30. Character states for species of Panscopus.

Taxon \ Char.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
alternatus	1	1	1	2	1	1	0	0	0	0	1	0	1	0	1	1	1	1	1	0	0
erinaceus	1	2	1	2	1	1	0	0	0	1	0	1	1	1	1	1	1	1	?	?	0
impressus	1	2	1	2	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1	0	0
maculosis	1	2	1	2	0	1	1	1	1	1	1	0	0	0	0	0	0	1	?	?	0
ovatipennis	1	2	1	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
gemmatus	2	2	1	2	1	0	0	0	0	0	0	1	2	1	1	0	0	0	0	3	0
longiscapus	2	2	1	2	1	0	0	0	0	1	0	2	1	1	1	0	0	0	2	3	0
squamosus	2	2	1	2	0	0	0	0	0	1	1	2	1	0	2	0	0	0	2	3	0
michelbacheri	2	2	1	2	0	0	0	0	1	1	0	2	1	1	1	0	0	0	2	3	0
convergens	2	2	1	2	1	0	0	0	0	0	1	1	2	0	1	0	0	0	0	2	0
oregonensis	2	2	1	2	1	0	0	0	0	0	1	1	1	0	1	0	0	0	0	2	0
costatus	2	2	0	1	1	1	0	0	1	0	0	2	3	1	2	0	0	0	?	?	1
capizzii	2	2	0	1	1	1	0	0	1	0	1	1	3	1	2	0	0	0	0	2	1
aequalis	2	2	0	1	0	0	0	0	0	1	0	0	1	1	0	0	0	0	?	?	0
squamifrons	2	2	0	2	0	0	0	0	0	1	0	1	1	1	0	0	0	0	0	1	0
abruptus	2	2	1	1	1	0	0	0	0	0	0	2	2	1	1	0	0	0	0	1	0
rugicollis	2	2	0	1	1	0	0	0	0	1	0	1	2	1	1	0	0	0	?	?	0
bufo	2	2	0	1	1	0	0	0	0	1	0	1	2	1	1	0	0	0	0	1	0
johnsoni	2	2	1	1	1	0	0	0	0	1	1	1	2	0	2	0	0	0	1	1	0
schwarzi	2	2	0	0	1	0	0	0	0	0	0	2	2	1	1	0	0	0	0	1	0
coloradensis	2	2	0	0	1	0	0	0	0	1	0	2	1	1	1	0	0	0	0	1	0
longus	2	2	1	0	1	0	0	0	0	1	0	1	2	1	0	0	0	0	?	?	0
torpidus	2	2	1	0	1	0	0	0	0	1	1	1	2	0	1	0	0	0	0	1	0
tricarinatus	2	2	1	1	1	0	0	0	0	1	0	1	2	1	1	0	0	0	0	1	0
bakeri	2	2	1	1	1	0	0	0	0	0	0	0	2	1	2	0	0	0	1	1	0
ovalis	2	2	1	0	1	0	0	0	0	0	1	2	2	1	1	0	0	0	?	?	0
acusetos	2	2	1	2	1	0	0	0	0	0	0	1	1	0	0	0	0	1	0	2	0
outgroup	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	?	?	0

Table 30 (cont'd). Character states for species of Panscopus.

Taxon \ Char.	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
alternatus	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0
erinaceus	0	0	0	0	0	0	0	0	?	1	0	?	0	1	0	0	0	?	0	?	0
impressus	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0
maculosis	0	0	0	0	0	0	1	0	?	0	0	?	0	0	0	0	0	?	0	?	0
ovatipennis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
gemmatus	1	1	0	0	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
longiscapus	1	1	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
squamosus	1	2	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
michelbacheri	1	1	1	0	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
convergens	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
oregonensis	?	1	1	1	1	0	1	?	0	1	2	0	0	0	0	0	0	0	0	0	0
costatus	0	0	0	0	0	0	0	0	?	0	0	?	0	0	0	0	0	?	0	?	0
capizzii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
aequalis	1	0&1	0	0	1	0	0	0	?	0	1	?	0	1	1	0	0	?	0	?	0
squamifrons	1	0&1	0	0	1	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	1
abruptus	1	1	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0
rugicollis	1	0&1	0	0	0	1	0	0	?	0	0	?	0	1	1	1	0	?	0	?	0
bufo	1	1	0	0	0	1	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0
johnsoni	1	1	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
schwarzi	1	1	0	0	0	1	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0
coloradensis	1	1	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
longus	1	0	0	0	0	1	0	0	?	0	0	?	0	0	0	0	0	0	0	?	0
torpidus	1	1	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
tricarinatus	1	1	0	0	0	1	0	0	0	0	1	2	1	1	0	0	0	0	0	0	0
bakeri	1	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0
ovalis	1	1	0	0	0	1	0	0	?	0	0	?	1	0	0	0	0	?	0	?	0
acusetos	?	1	1	1	1	0	0	?	0	0	0	0	0	0	0	0	0	?	0	0	1
outgroup	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

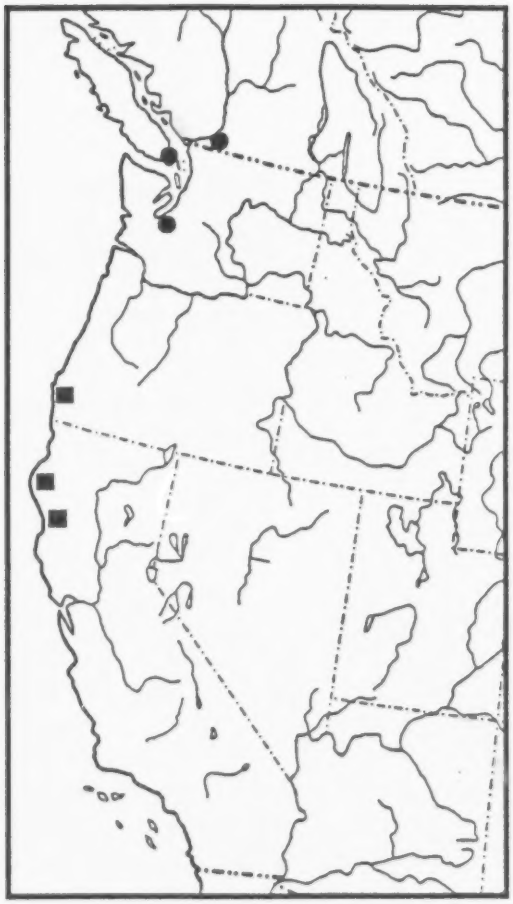
10. APPENDIX B.: MAPS.



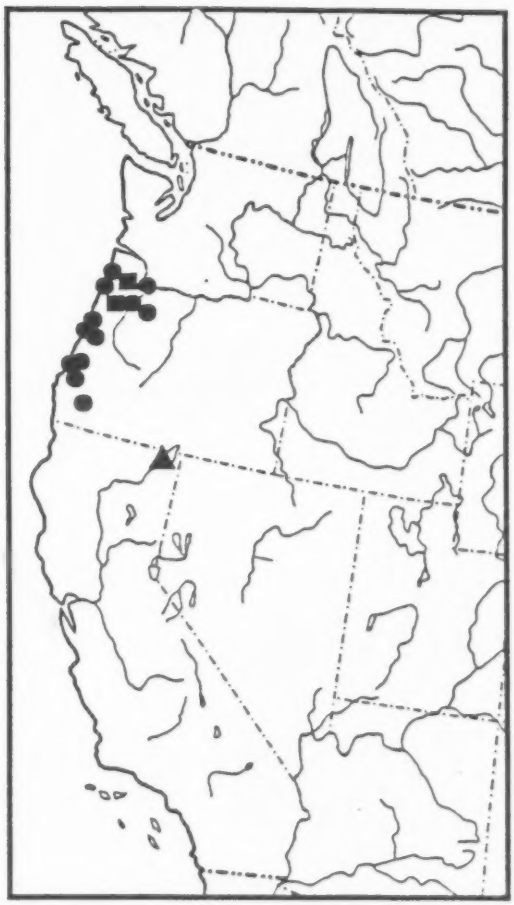
Map 1. Known geographical distribution of *Panscopus maculosus* Blatchley (●), and *P. ovatipennis* Buchanan (■).

Map 2. Known geographical distribution of *Panscopus alternatus* Schaeffer.

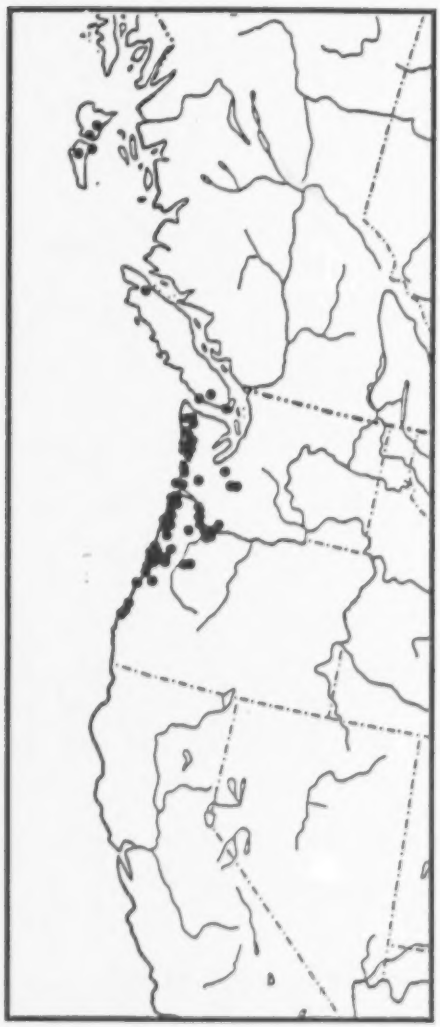
Map 3. Known geographical distribution of *Panscopus erinaceus* (Say) (●), and *P. impressus* Pierce(■).



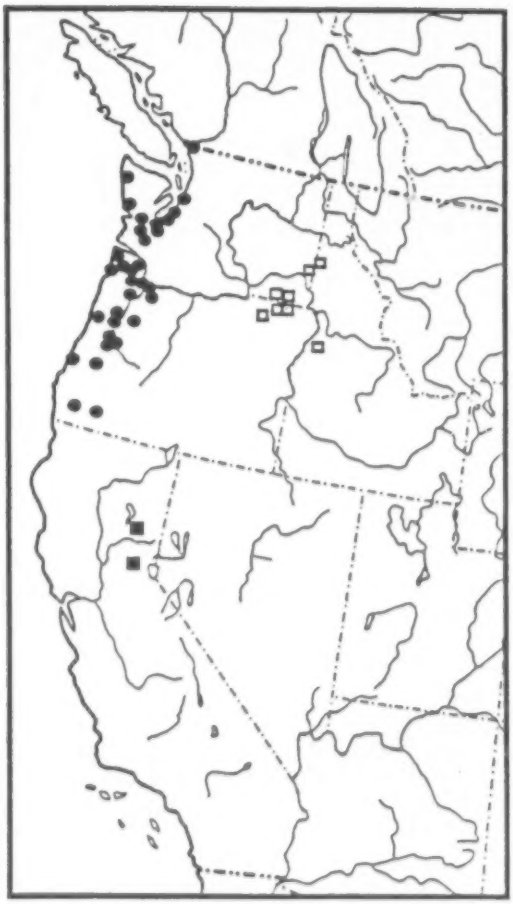
Map 4. Known geographical distribution of *Panscopus costatus* Buchanan (●), and *P. capizzii* (Hatch) (■).



Map 5. Known geographical distribution of *Panscopus convergens* Buchanan (●), *P. oregonensis* Buchanan (■), and *P. acutisetus* new species (▲).

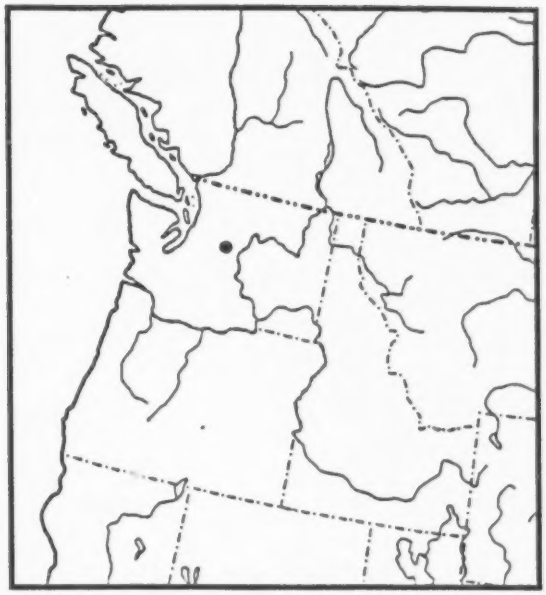


Map 6. Known geographical distribution of *Panscopus gemmatus* (LeConte).

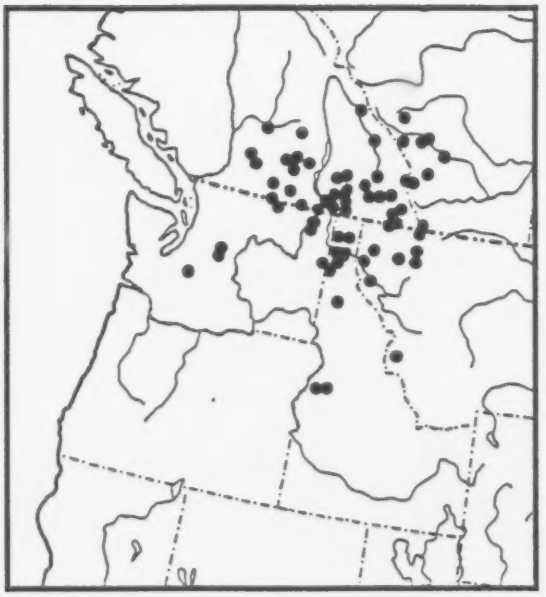


Map 7. Known geographical distribution of *Panscopus longiscapus* new species (●), *P. squamosus* Pierce (□), and *P. michelbacheri* Ting (■).

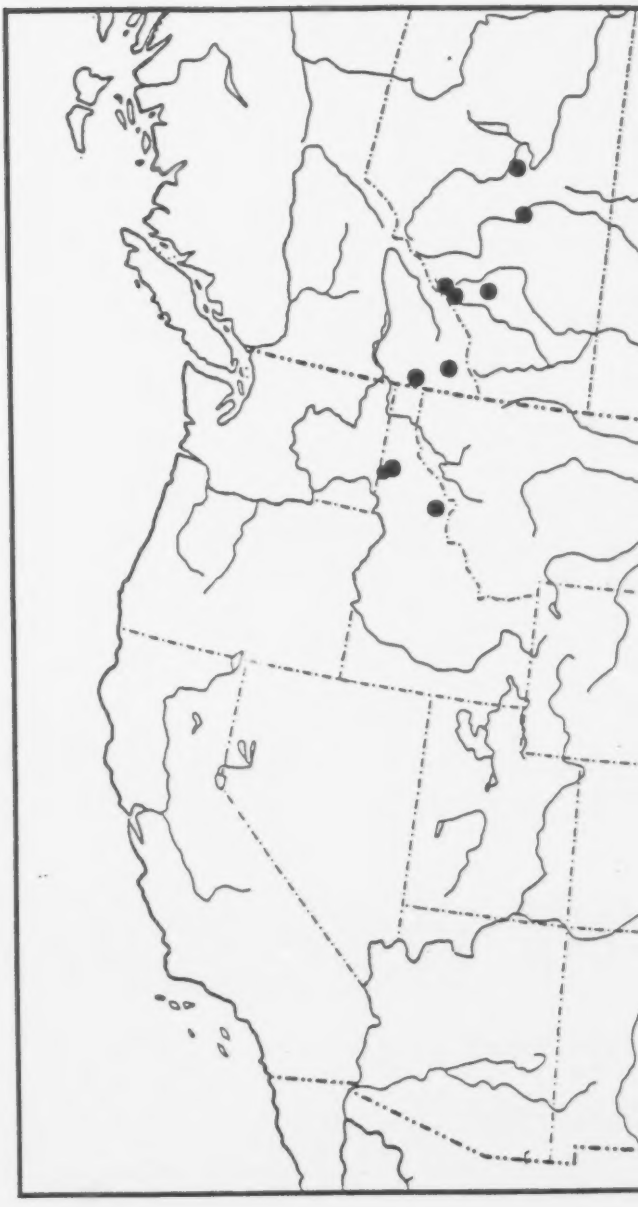
Map 8. Known geographical distribution of *Panscopus johnsoni* Van Dyke (●), and *P. bakeri* (■).



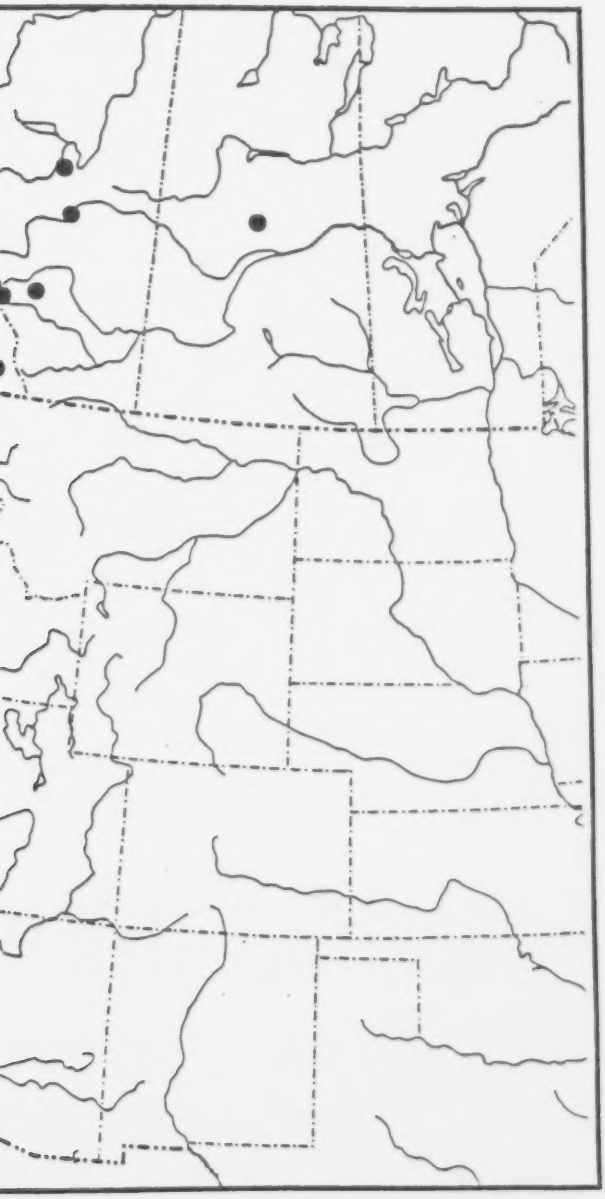
Map 9. Known geographical distribution of *Panscopus longus* Buchanan.



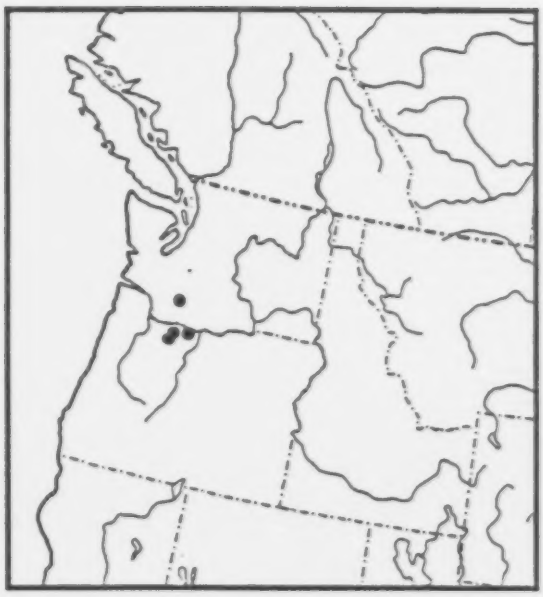
Map 10. Known geographical distribution of *Panscopus torpidus* (LeConte).



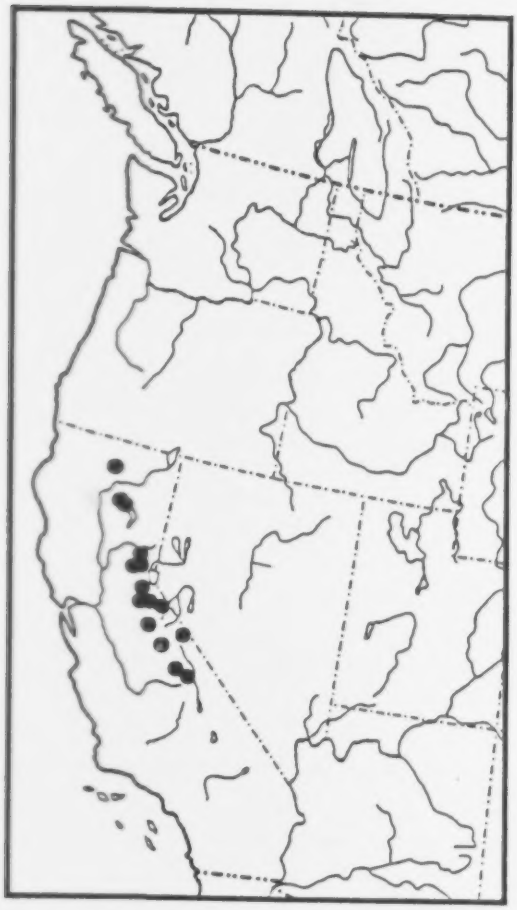
Map 11. Known geographical distribution of



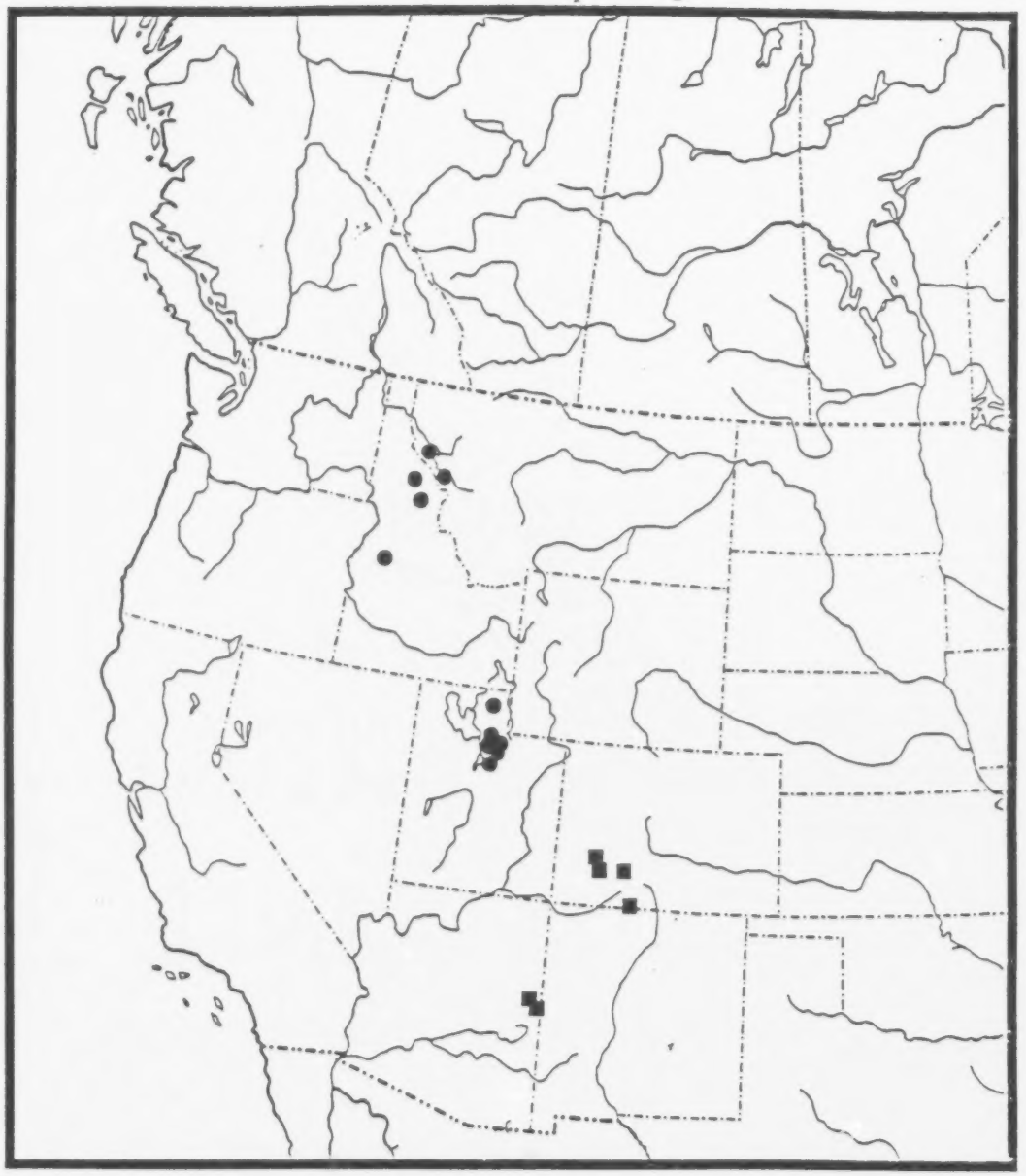
distribution of *Panscopus ovalis* Pierce.



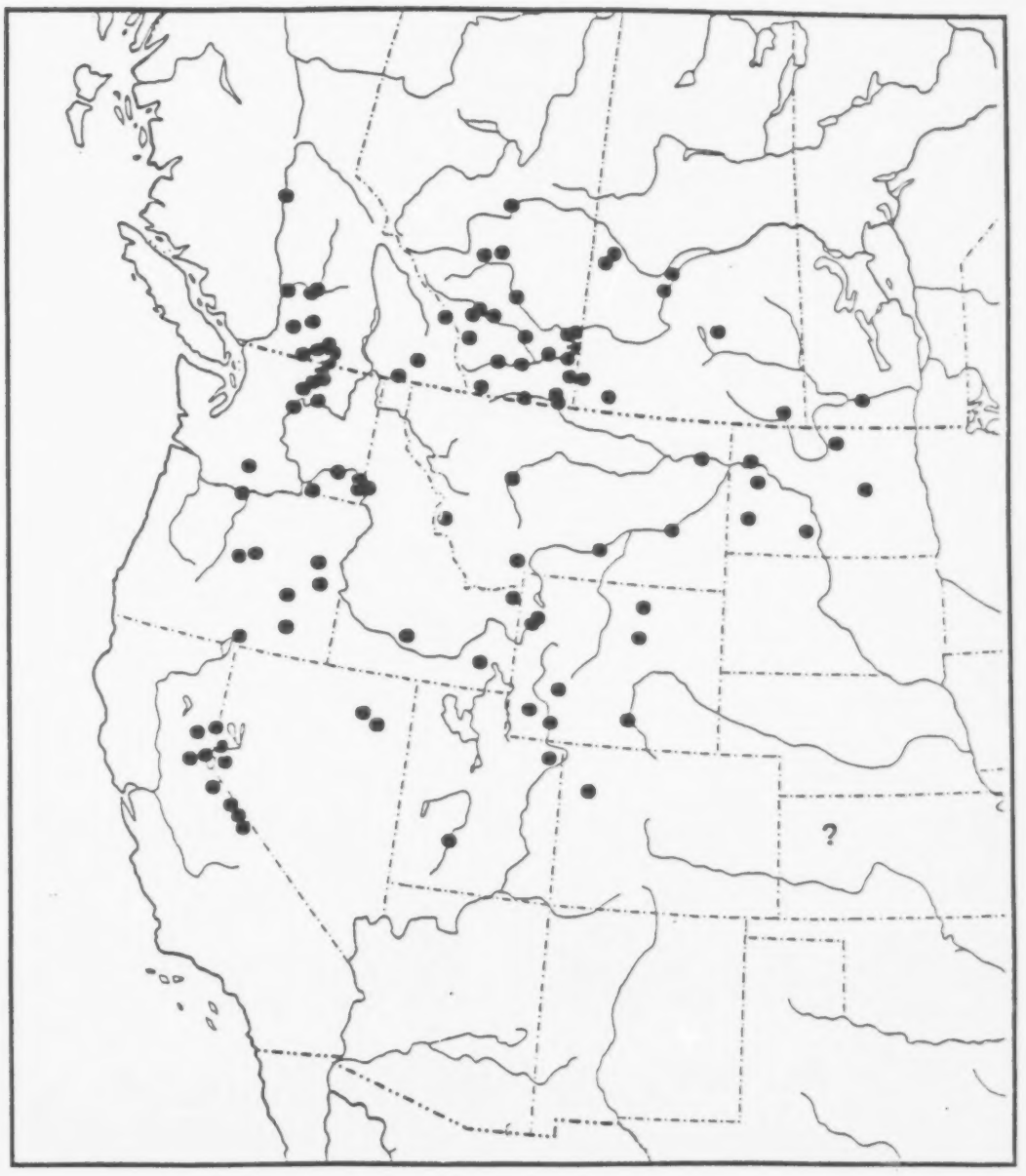
Map 12. Known geographical distribution of *Panscopus tricarinatus* Buchanan.



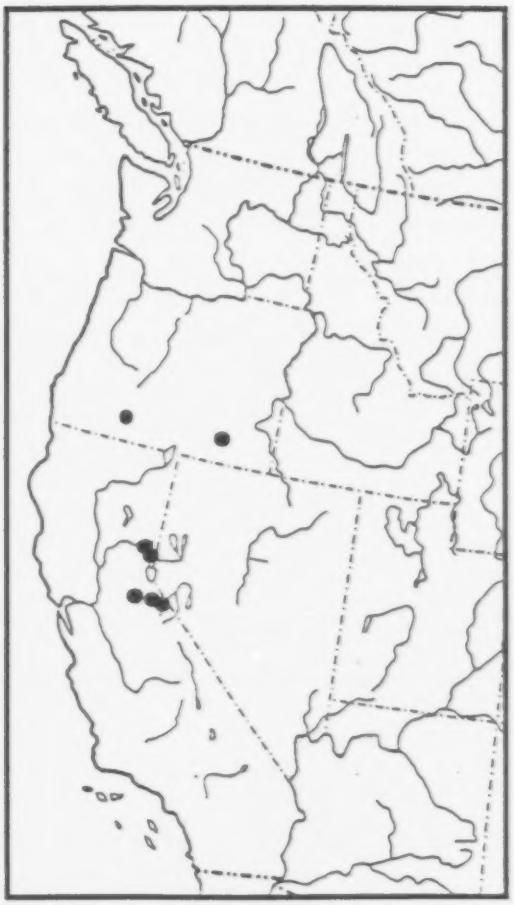
Map 13. Known geographical distribution of *Panscopus bufo* Buchanan.



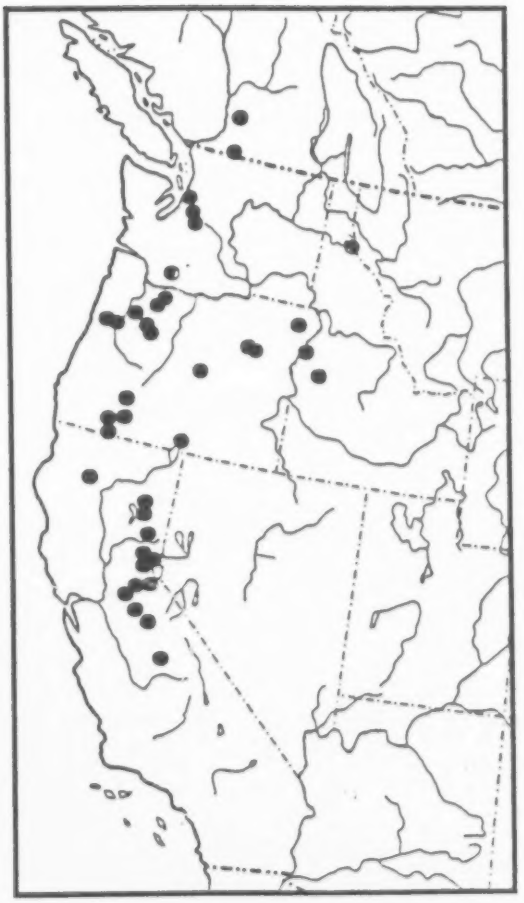
Map 14. Known geographical distribution of *Panscopus schwarzi* Buchanan (●), and *P. coloradensis* Van Dyke (■).



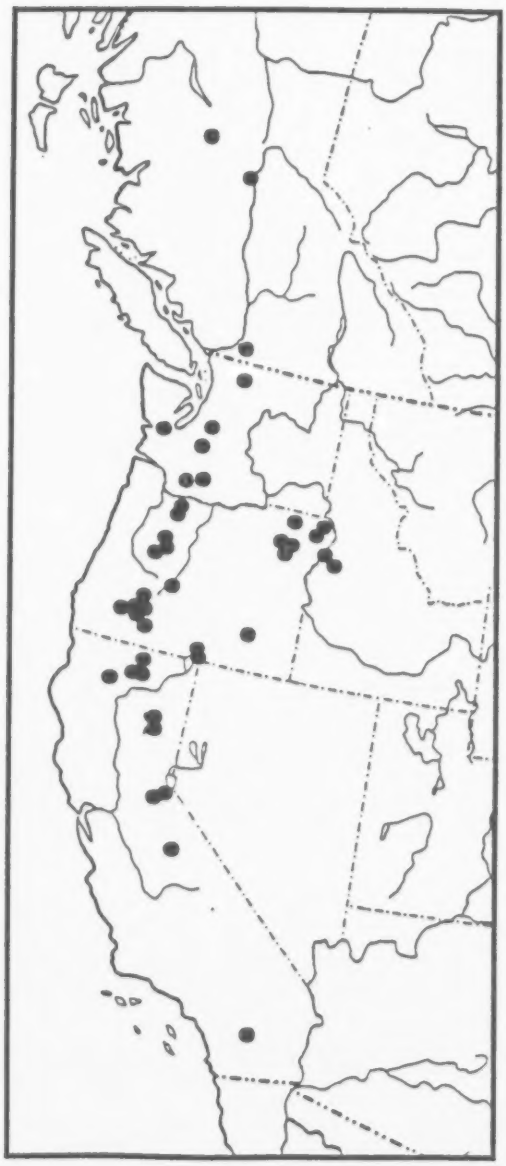
Map 15. Known geographical distribution of *Panscopus aequalis* (Horn).



Map 16. Known geographical distribution of *Panscopus squamifrons* Pierce.

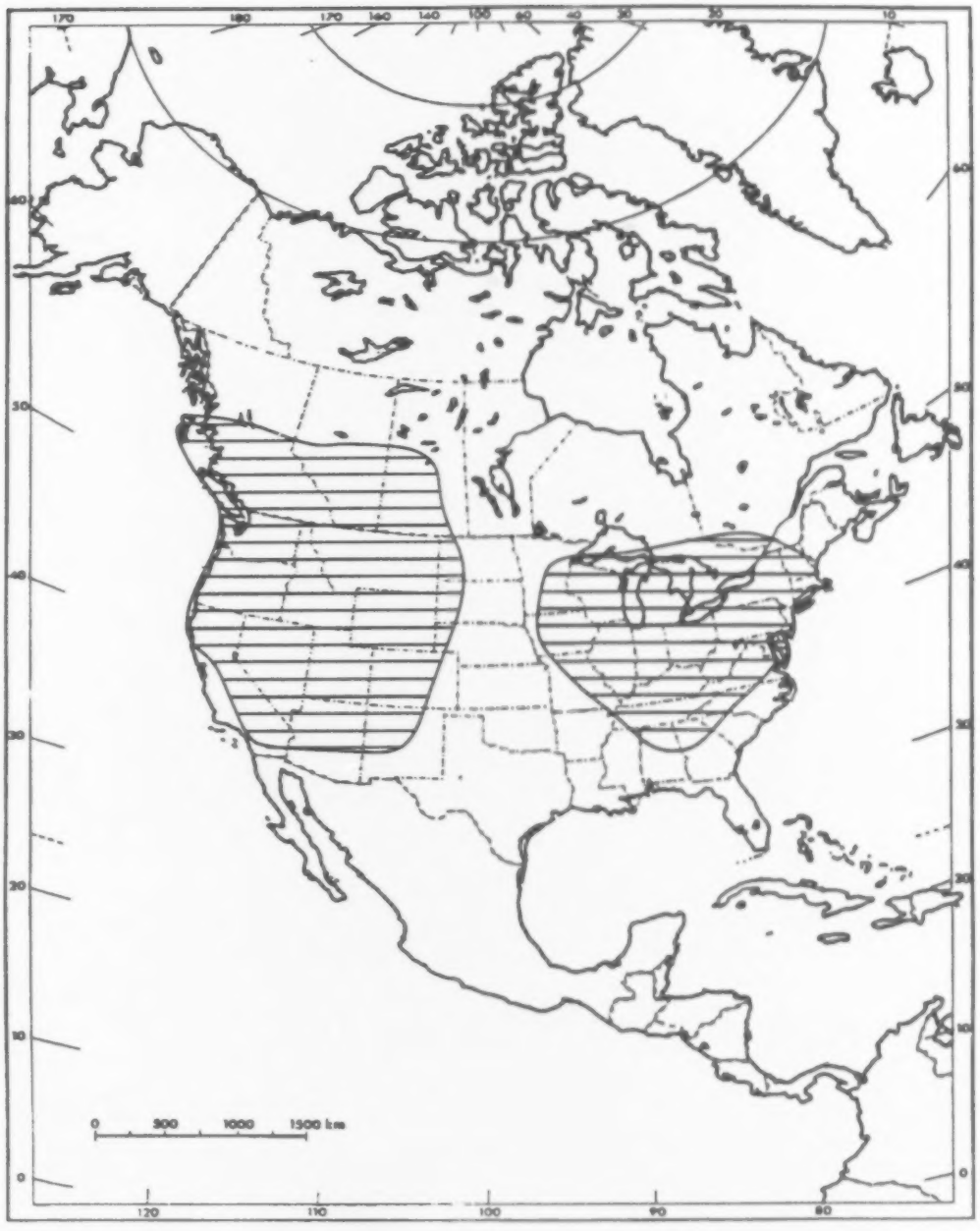


Map 17. Known geographical distribution of *Panscopus abruptus* (Casey).



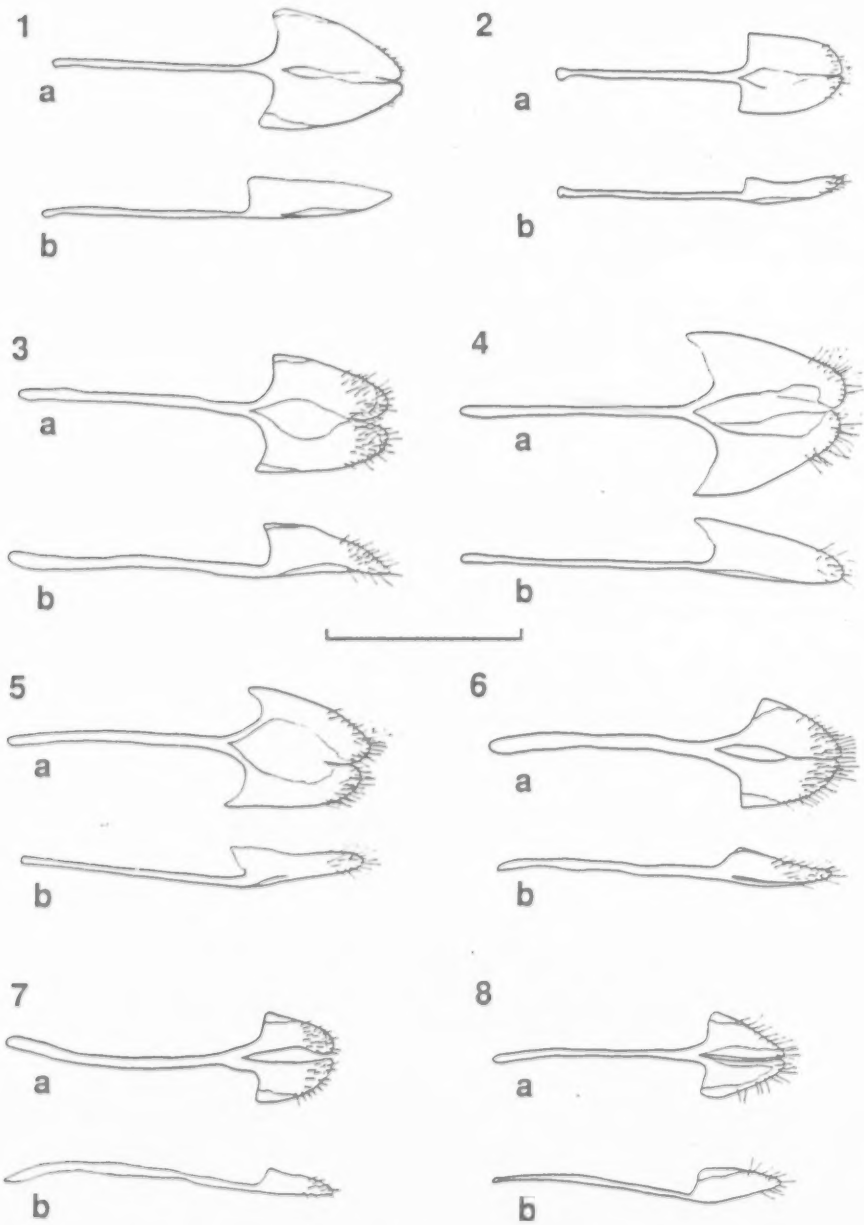
Map 18. Known geographical distribution of *Panscopus rugicollis* Buchanan.

Map 19. Zones of disjunction between distributions of sister lineages in the genus *Panscopus* Schönherr.

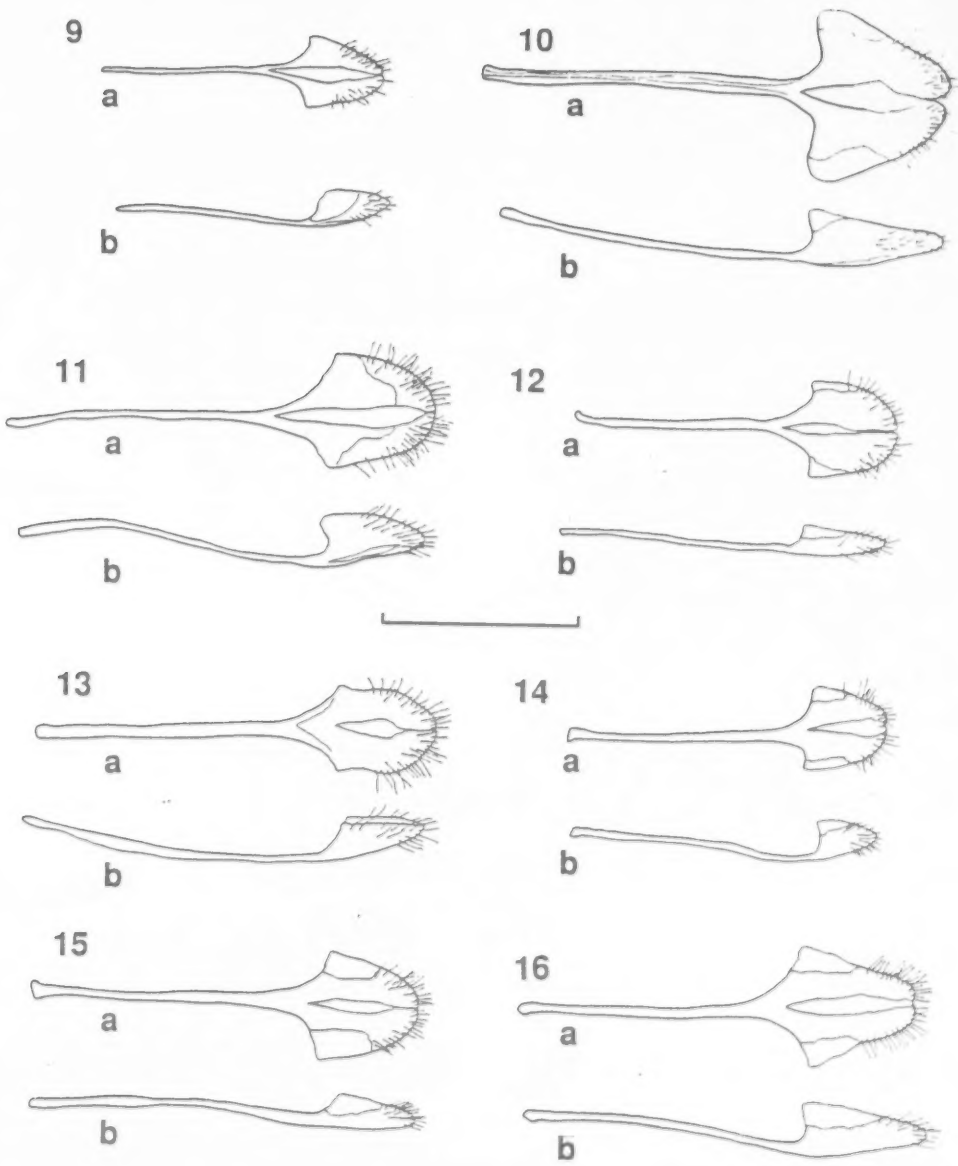


Map 20. Known distribution of weevils of the genus *Panscopus* Schönherr.

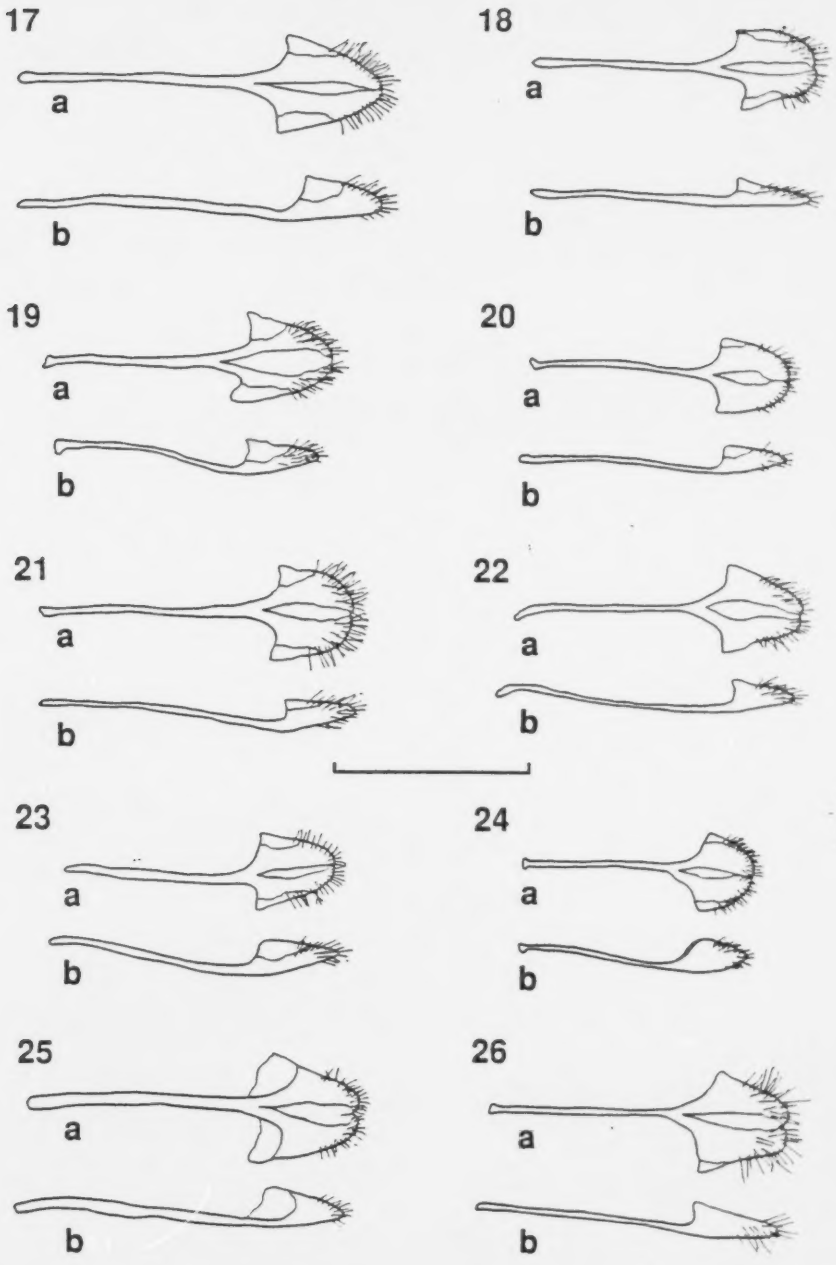
11. APPENDIX C. FIGURES.



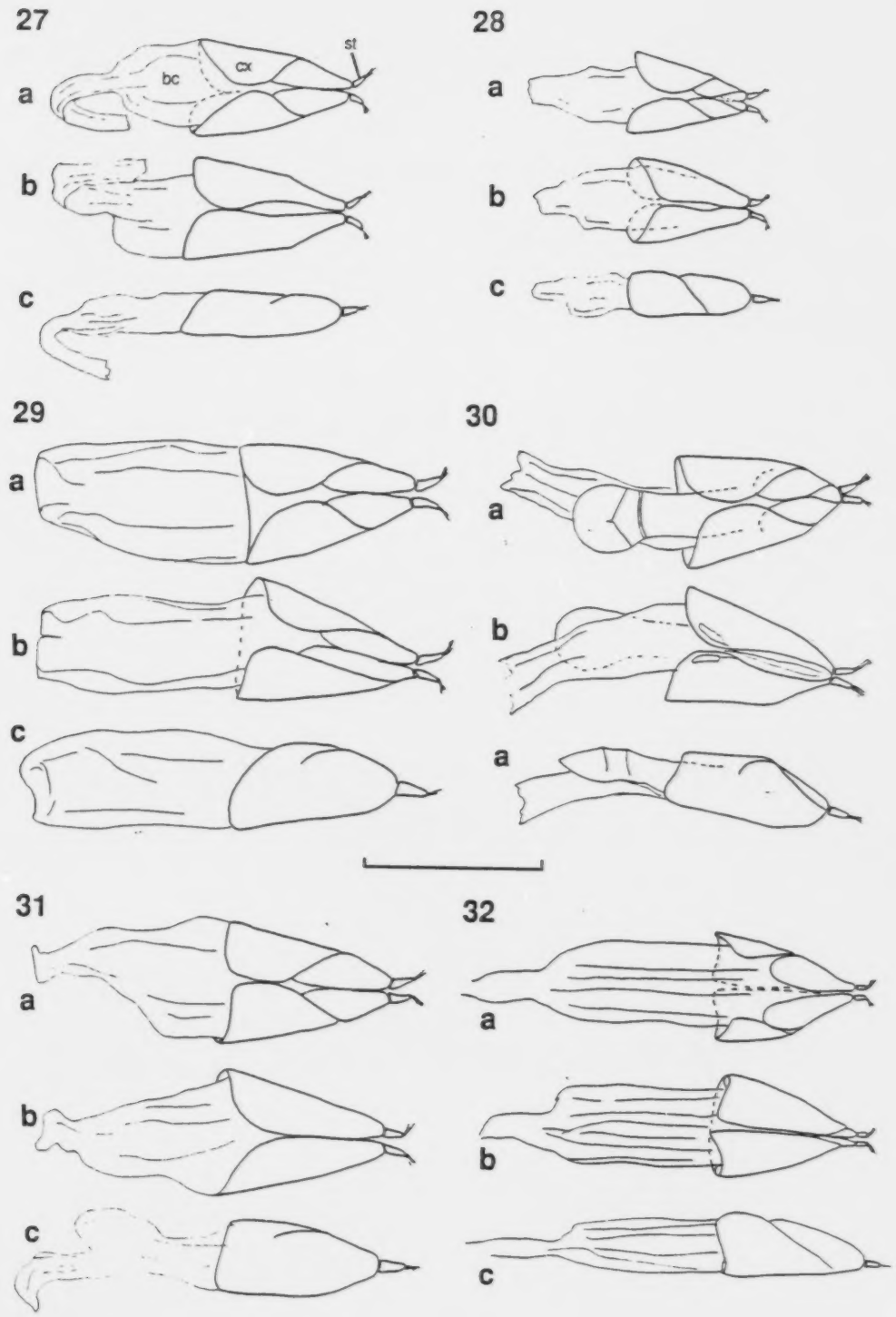
Figs. 1-8. Sternum 8 (spiculum ventrale) in ventral view (a) and left lateral view (b) for *Panscopus* species: 1, *P. maculosus* ; 2, *P. ovatipennis* ; 3, *P. alternatus* ; 4, *P. erinaceus* ; 5, *P. impressus* ; 6, *P. costatus* ; 7, *P. capizzii* ; 8, *P. convergens*. Scale bar represents 1 mm.



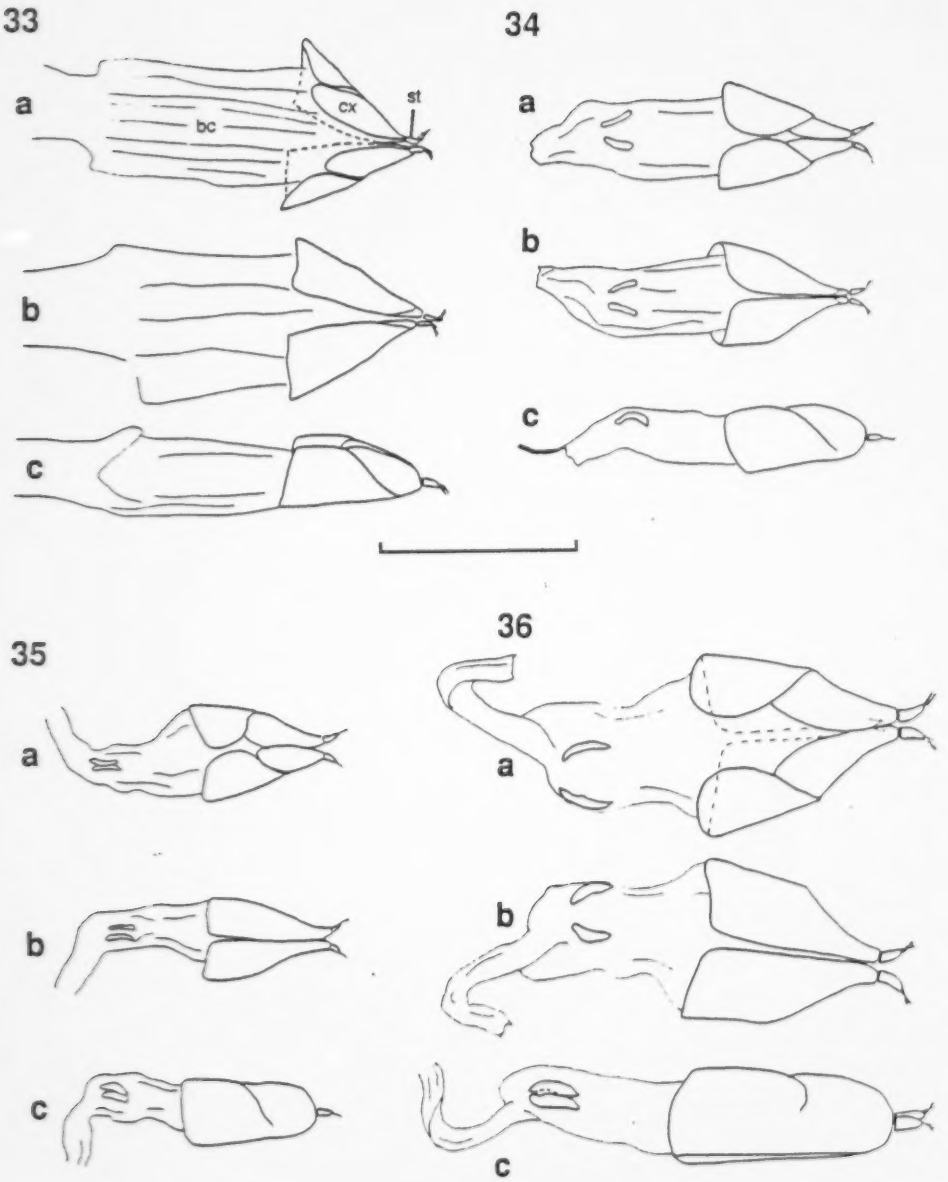
Figs. 9-16. Sternum 8 (spiculum ventrale) in ventral view (a) and left lateral view (b) for *Panscopus* species: 9, *P. acutisetus* ; 10, *P. gemmatus* ; 11, *P. longiscapus* ; 12, *P. squamosus* ; 13, *P. michelbacheri* ; 14, *P. johnsoni* ; 15, *P. bakeri* ; 16, *P. longus* . Scale bar represents 1 mm.



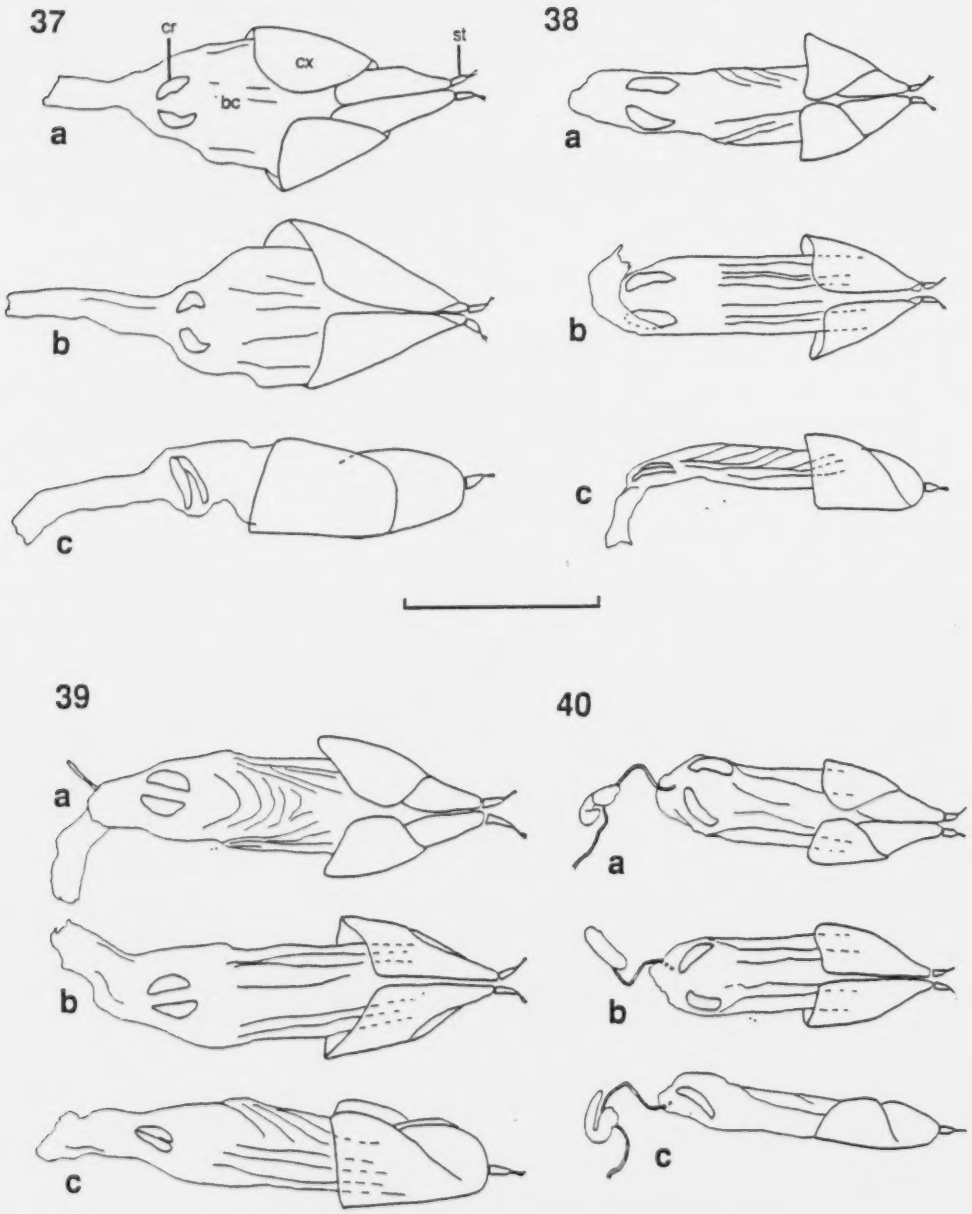
Figs 17-26. Sternum 8 (spiculum ventrale) in ventral view (a) and left lateral view (b) for *Panscopus* species: 17, *P. torpidus* ; 18, *P. ovalis* ; 19, *P. tricarinatus* ; 20, *P. bufo* ; 21, *P. schwarzi* ; 22, *P. coloradensis* ; 23, *P. aequalis* ; 24, *P. squamifrons* ; 25, *P. abruptus* ; 26, *P. rugicollis* . Scale bar represents 1 mm.



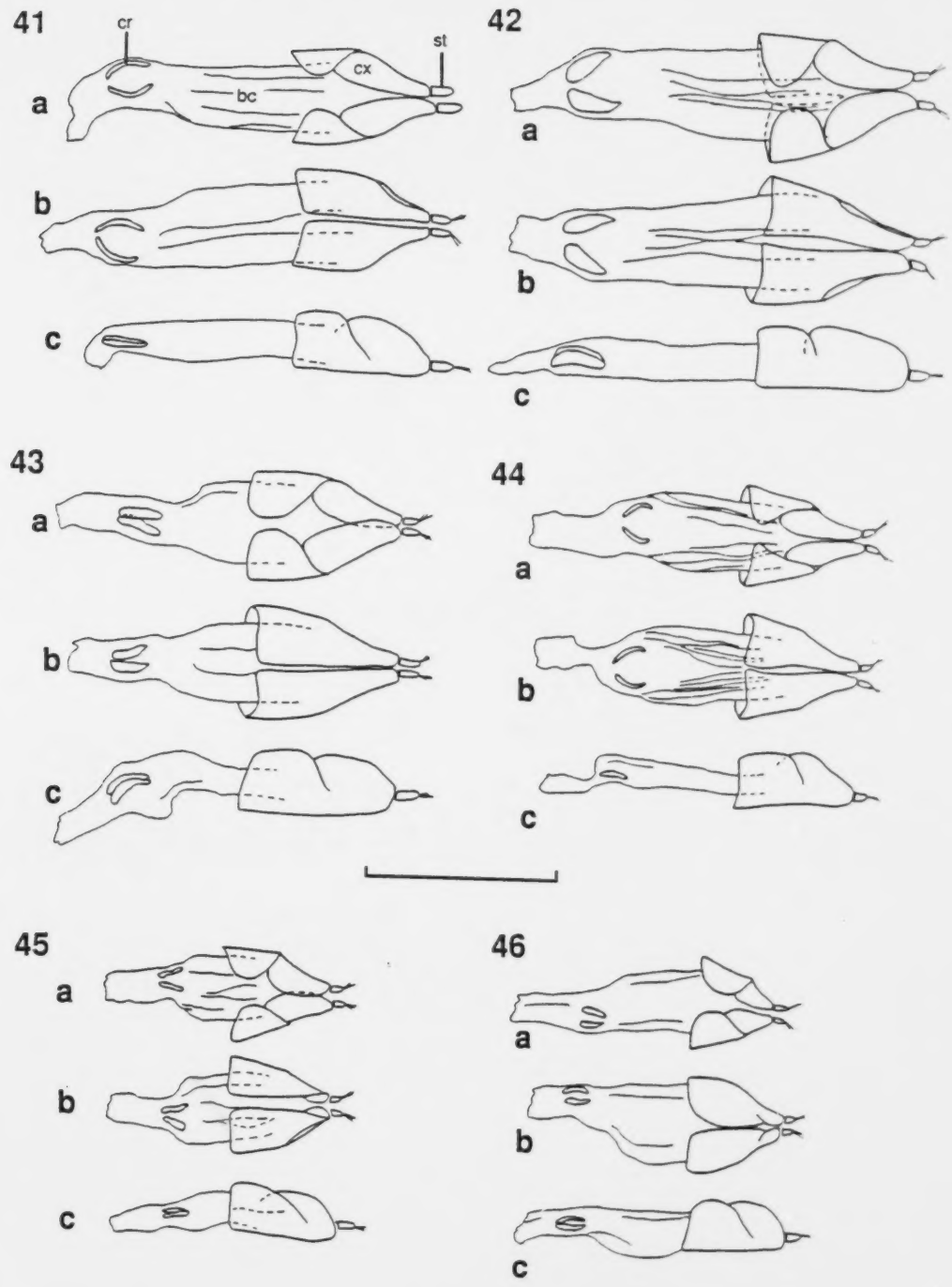
Figs. 27-32. Coxites and bursa copulatrices in dorsal view (a), ventral view (b), and left lateral view (c) for females of *Panscopus* species: 27, *P. maculosus* ; 28, *P. ovatipennis* ; 29, *P. alternatus* ; 30, *P. erinaceus* ; 31, *P. impressus* ; 32, *P. costatus* . Scale bar represents 1 mm. Abbreviations: bc, bursa copulatrix; cx, coxites; st, stylus.



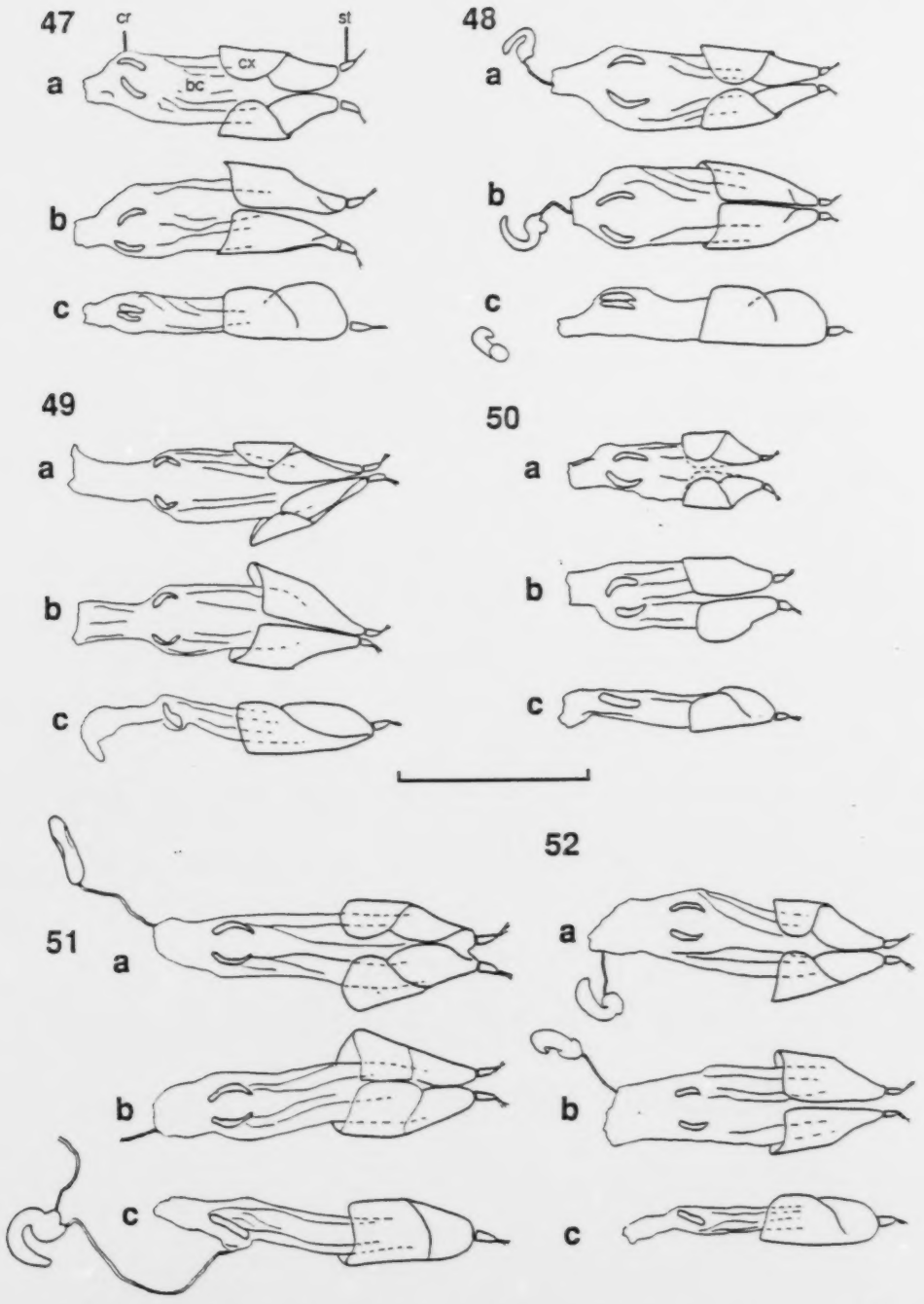
Figs 33-36. Coxites and bursa copulatrices in dorsal view (a), ventral view (b), and left lateral view (c) for females of *Panscopus* species: 33, *P. capizzii* ; 34, *P. convergens* ; 35, *P. acutisetus* ; 36, *P. gemmatus* . Scale bar represents 1 mm. Abbreviations: bc, bursa copulatrix; cr, crescent-shaped sclerites; cx, coxites; st, stylus.



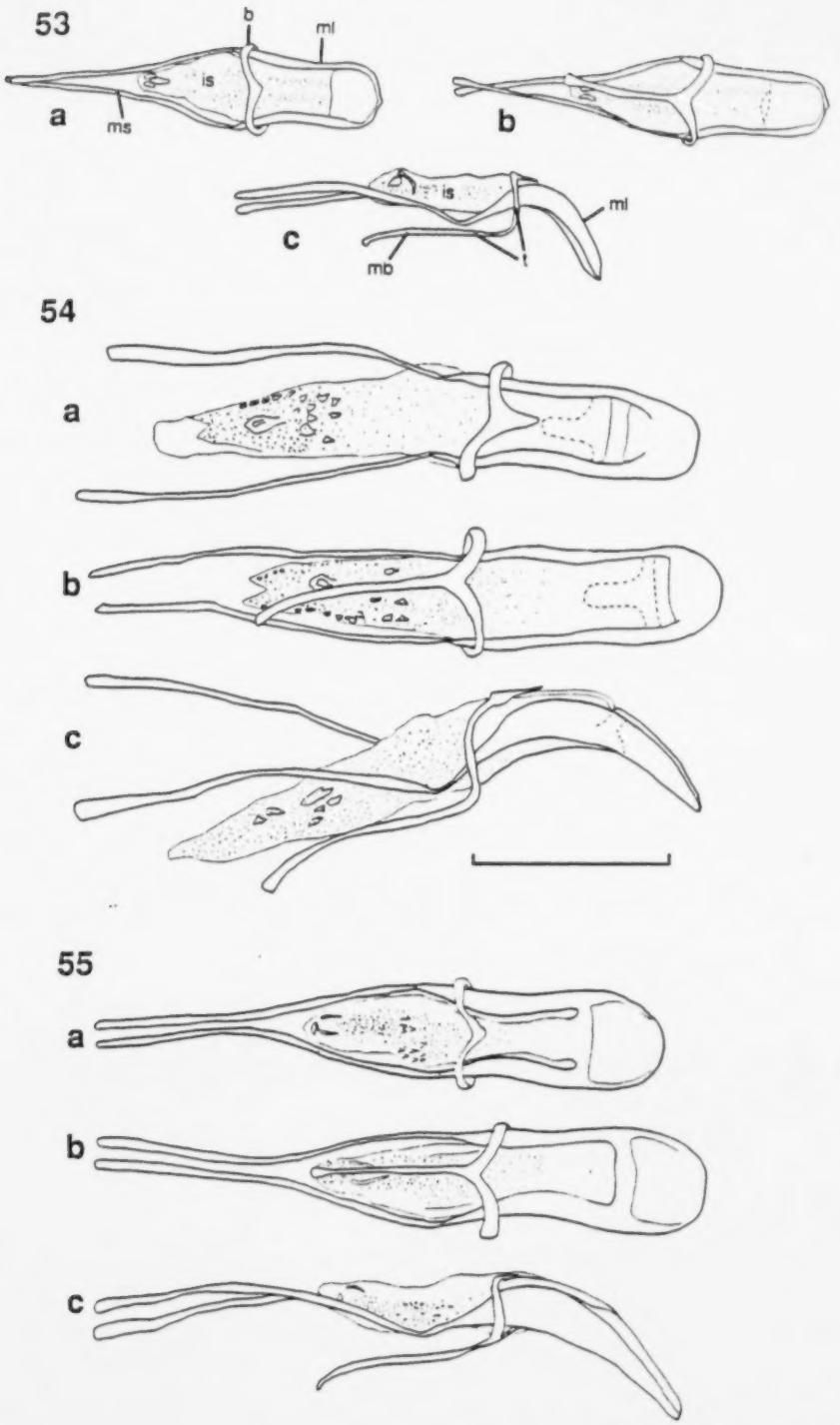
Figs. 37-40. Coxites and bursa copulatrices in dorsal view (a), ventral view (b), and left lateral view (c) for females of *Panscopus* species: 37, *P. longiscapus* ; 38, *P. squamosus* ; 39, *P. michelbacheri* ; 40, *P. johnsoni* . Scale bar represents 1 mm. Abbreviations: bc, bursa copulatrix; cr, crescent-shaped sclerites; cx, coxites; st, stylus.



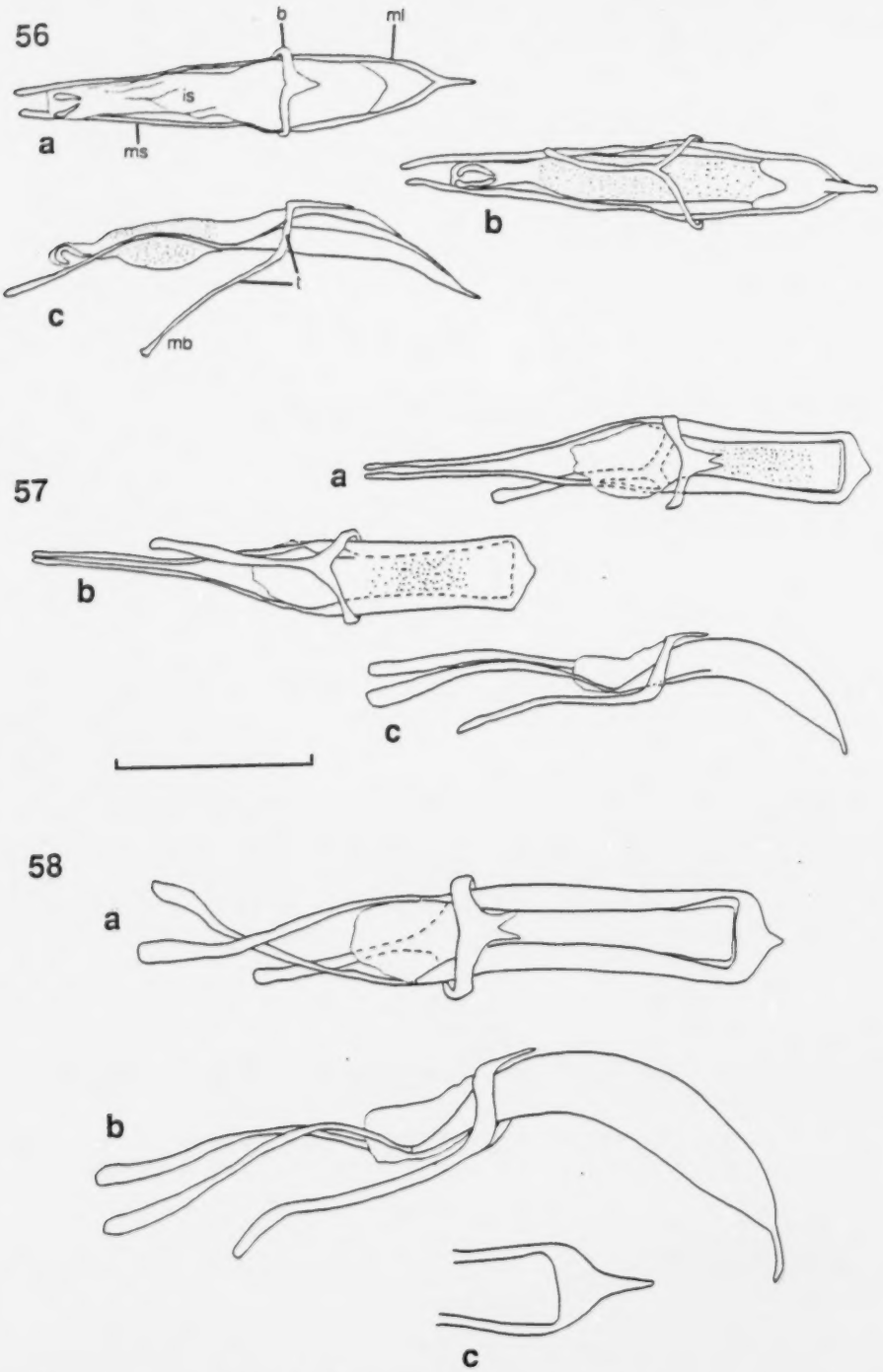
Figs. 41-46. Coxites and bursa copulatrices in dorsal view (a), ventral view (b), and left lateral view (c) for females of *Panscopus* species: 41, *P. bakeri* ; 42, *P. longus* ; 43, *P. torpidus* ; 44, *P. ovalis* ; 45, *P. tricarinatus* ; 46, *P bufo* . Scale bar represents 1 mm. Abbreviations: bc, bursa copulatrix; cr, crescent-shaped sclerites; cx, coxites; st, stylus.



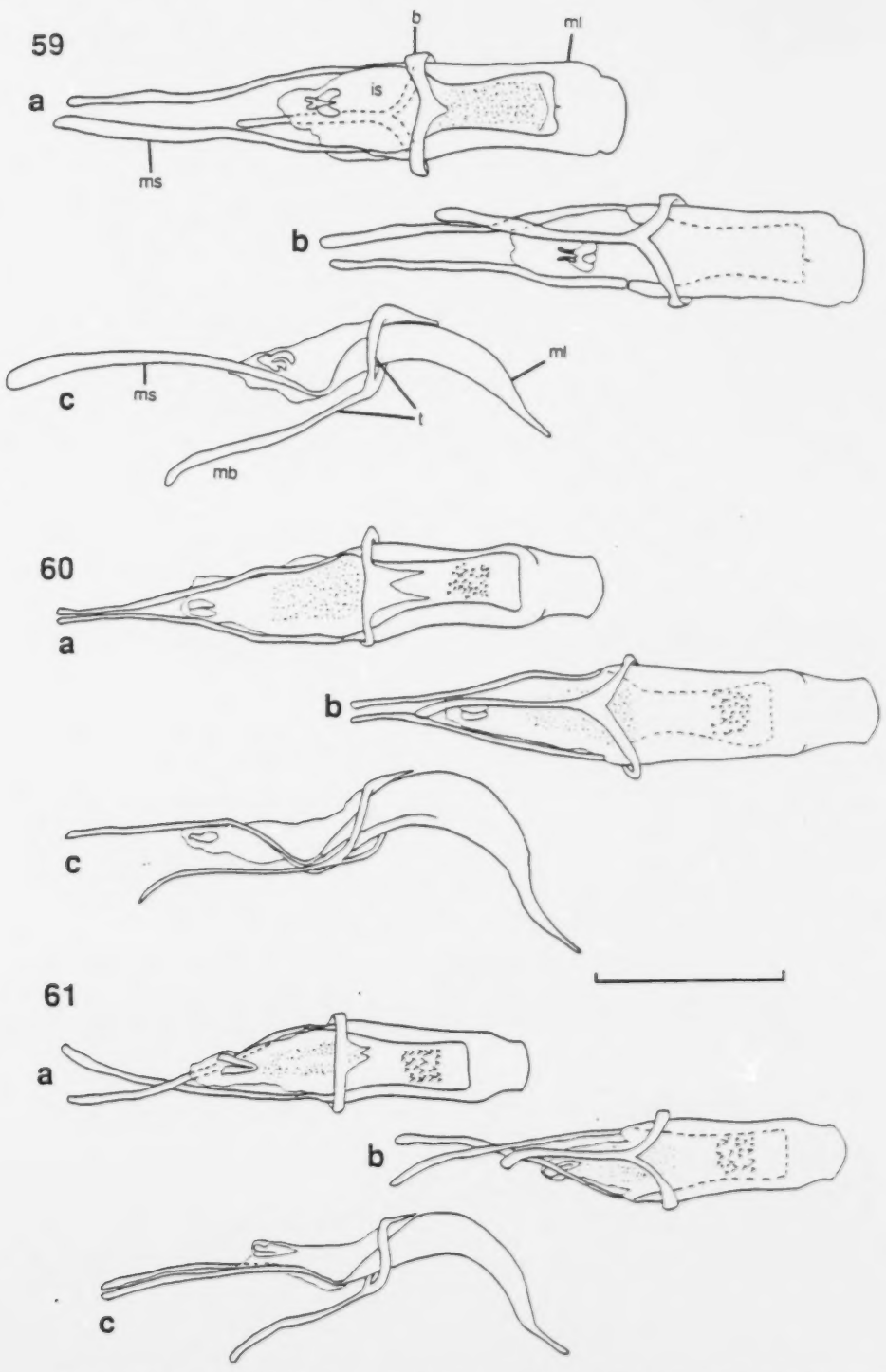
Figs. 47-52. Coxites and bursa copulatrices in dorsal view (a), ventral view (b), and left lateral view (c) for females of *Panscopus* species: 47, *P. schwarzi* ; 48, *P. coloradensis* ; 49,*P. aequalis* ; 50, *P. squamifrons* ; 51, *P. abruptus* ; 52, *P. rugicollis* . Scale bar represents 1 mm. Abbreviations: bc, bursa copulatrix; cr, crescent-shaped sclerites; cx, coxites; st, stylus.



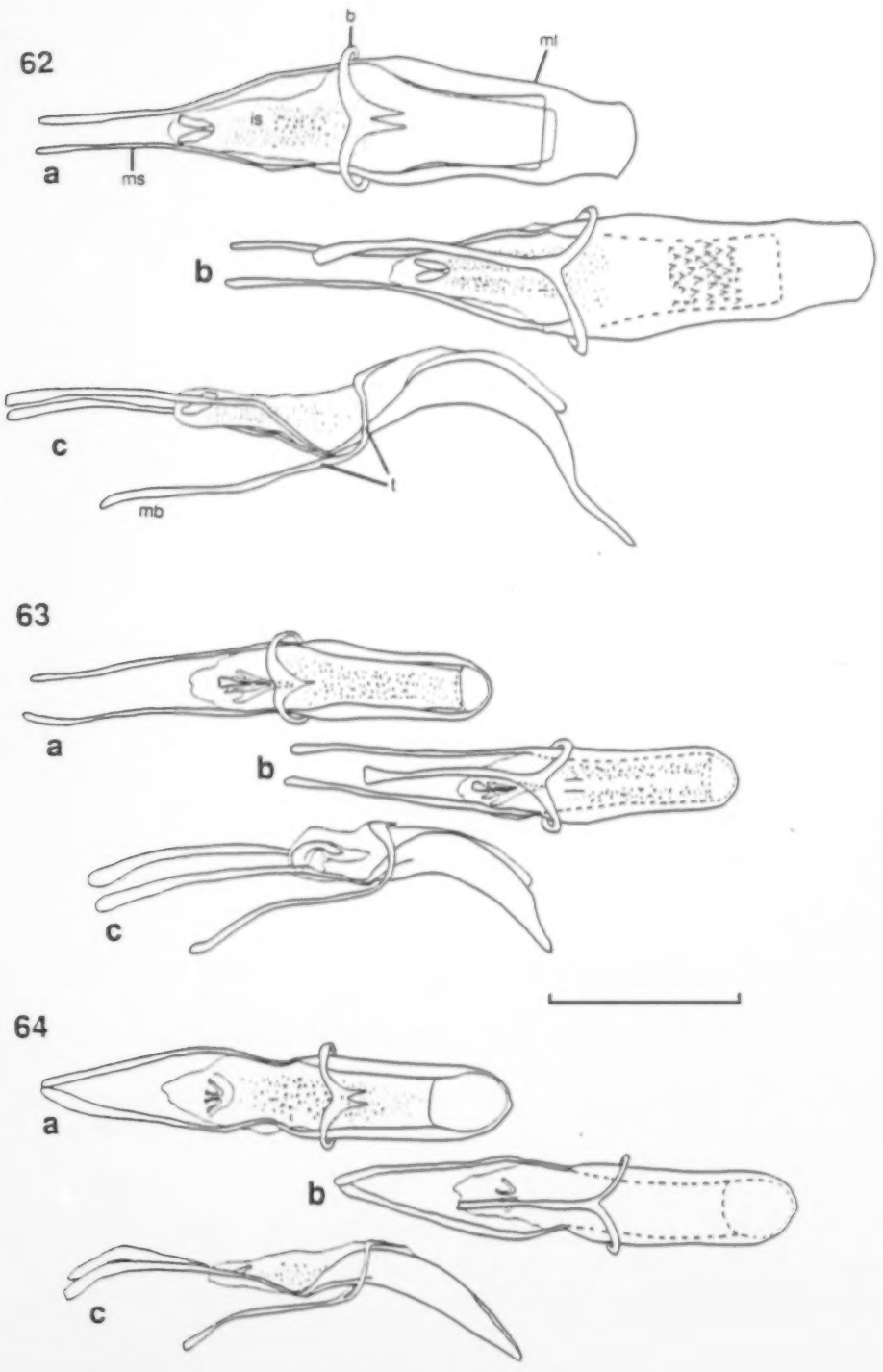
Figs. 53-55. Aedeagi in dorsal view (a), ventral view (b), and left lateral view (c) of males of *Panscopus* species: 53, *P ovatipennis* ; 54, *P. alternatus* ; 55, *P. impressus* . Scale bar represents 1 mm. Abbreviations: b, belt of tegmen; is, internal sac; mb, manubrium of tegmen; ml, median lobe; ms, median strut; t, tegmen.



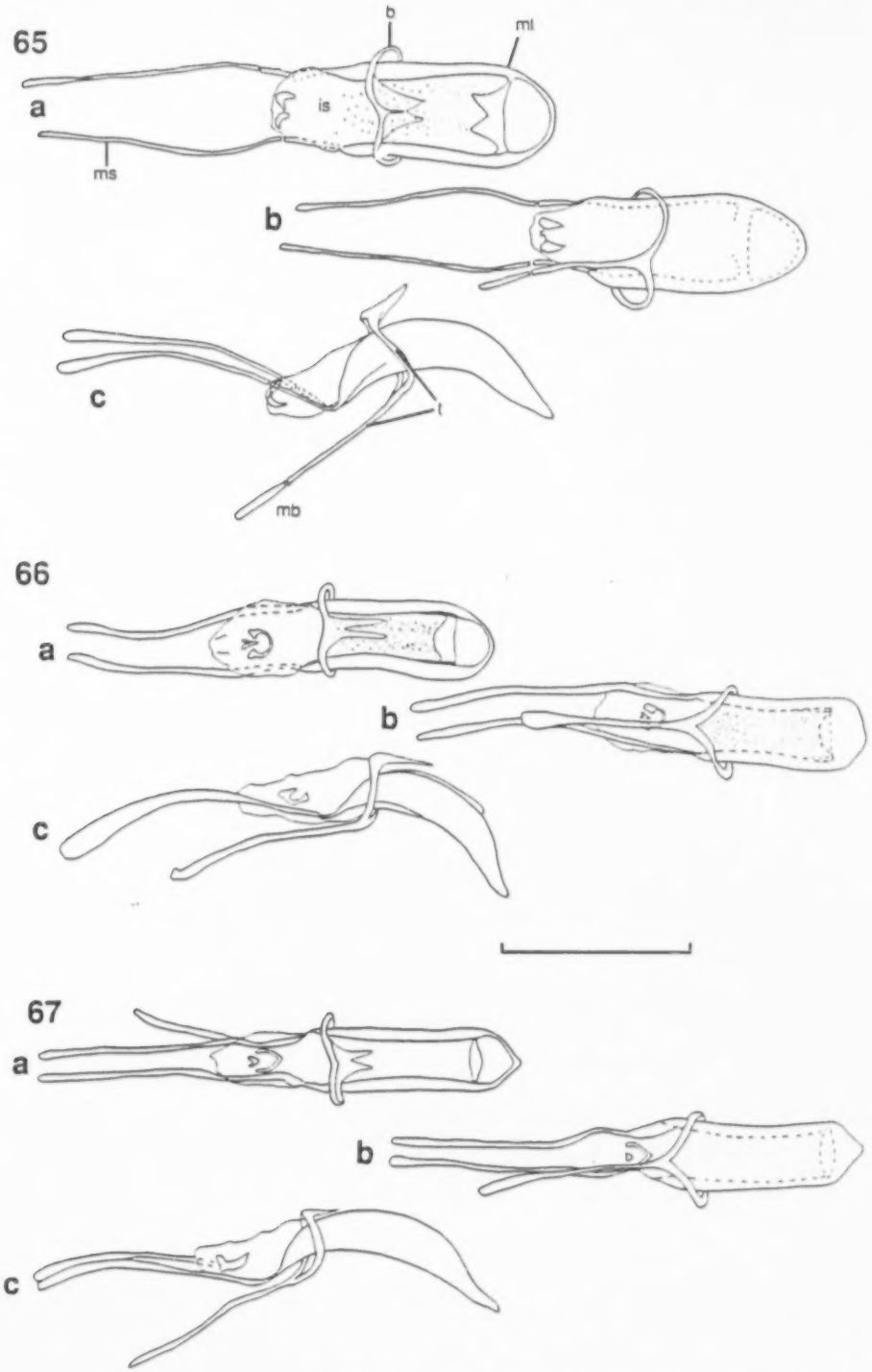
Figs. 56-58. Aedeagi of *Panscopus* species. 56 &57: Aedeagi in dorsal view (a), ventral view (b), and left lateral view (c) of males of *P. capizzii* (56), and *P. convergens* (57). 58: Dorsal view (a), left lateral (b), and postero-dorsal view of apex (c), of aedeagus of *P. oregonensis* . Scale bar represents 1 mm. Abbreviations: b, belt of tegmen; is, internal sac; mb, manubrium of tegmen; ml, median lobe; ms, median strut; t, tegmen.



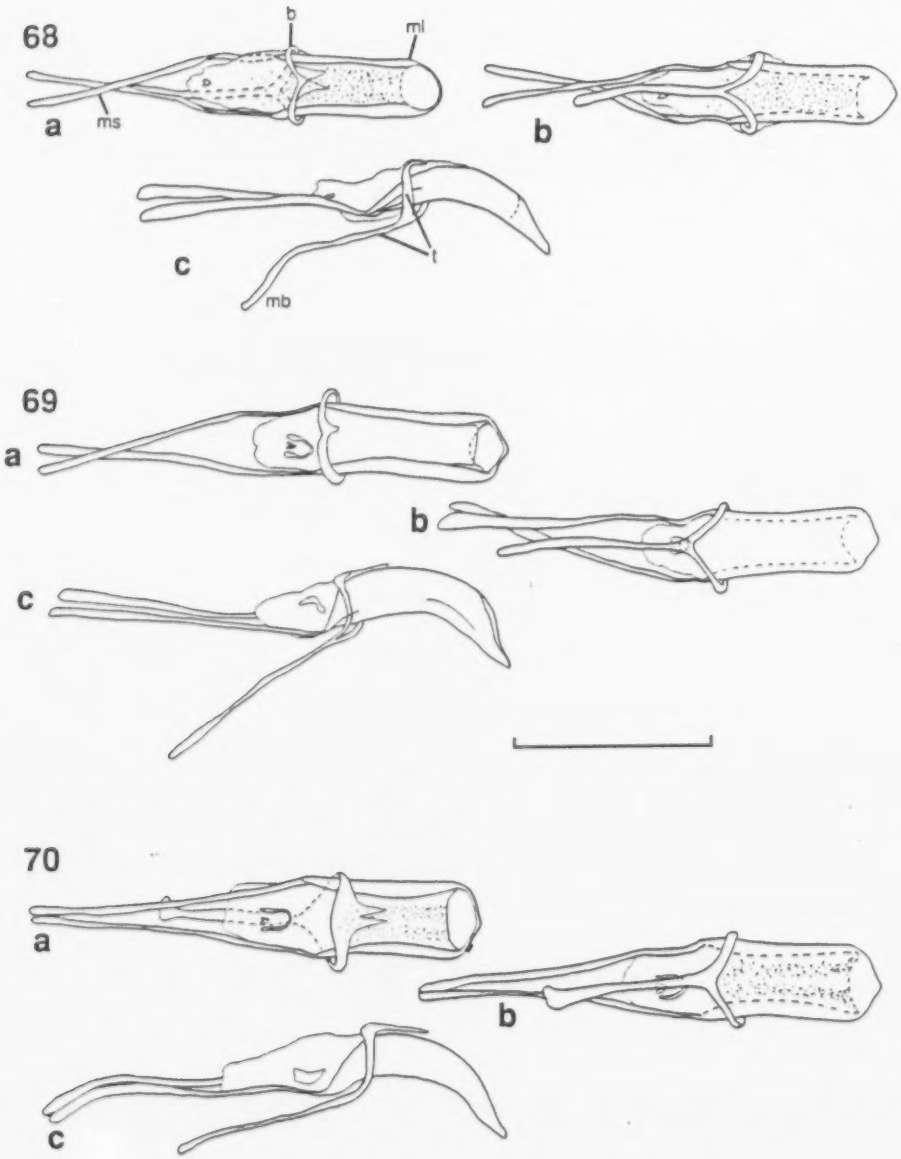
Figs. 59-61. Aedeagi in dorsal view (a), ventral view (b), and left lateral view (c) of males of *Panscopus* species: 59, *P. gemmatus* ; 60, *P. longiscapus* ; 61, *P. squamosus* . Scale bar represents 1 mm. Abbreviations: b, belt of tegmen; is, internal sac; mb, manubrium of tegmen; ml, median lobe; ms, median strut; t, tegmen.



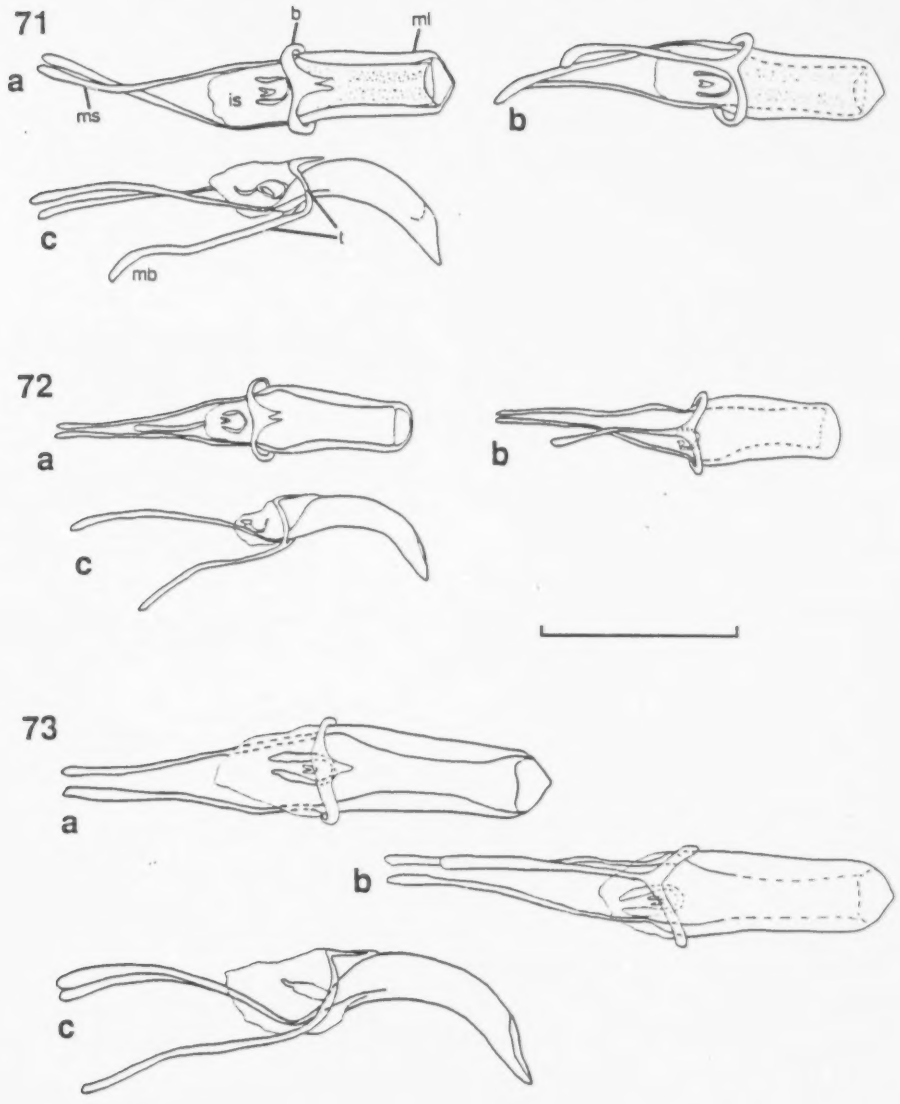
Figs. 62-64. Aedeagi in dorsal view (a), ventral view (b), and left lateral view (c) of males of *Panscopus* species: 62, *P. michelbacheri* ; 63, *P. johnsoni* ; 64, *P. bakeri* . Scale bar represents 1 mm. Abbreviations: b, belt of tegmen; is, internal sac; mb, manubrium of tegmen; ml, median lobe; ms, median strut; t, tegmen.



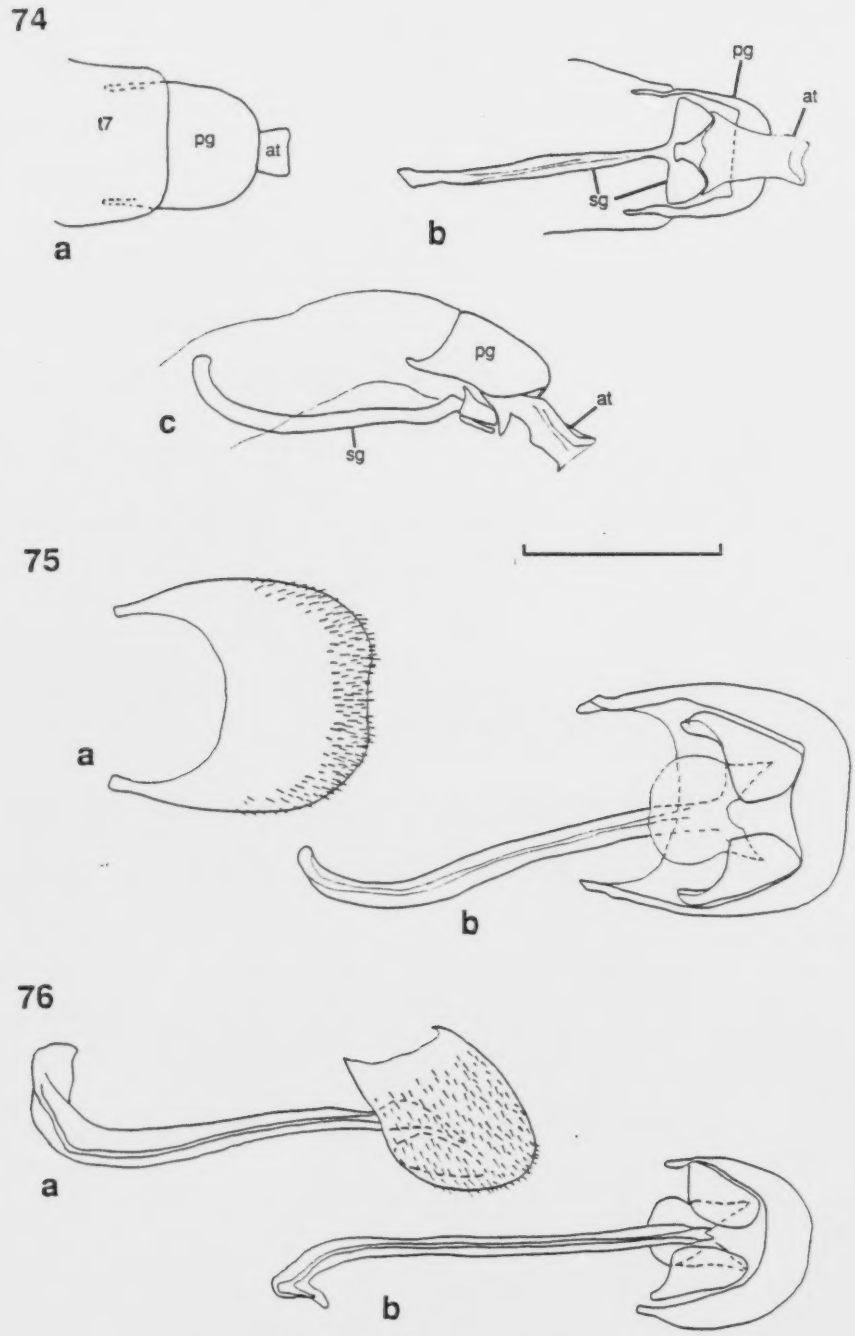
Figs. 65-67. Aedeagi in dorsal view (a), ventral view (b), and left lateral view (c) of males of *Panscopus* species: 65, *P. longus* ; 66, *P. torpidus* ; 67, *P. ovalis* . Scale bar represents 1 mm. Abbreviations: b, belt of tegmen; is, internal sac; mb, manubrium of tegmen; ml, median lobe; ms, median strut; t, tegmen.



Figs. 68-70. Aedeagi in dorsal view (a), ventral view (b), and left lateral view (c) of males of *Panscopus* species: 68, *P. tricarinatus* ; 69, *P. bufo* ; 70, *P. schwarzi*. Scale bar represents 1 mm. Abbreviations: b, belt of tegmen; is, internal sac; mb, manubrium of tegmen; ml, median lobe; ms, median strut; t, tegmen.



Figs. 71-73. Aedeagi in dorsal view (a), ventral view (b), and left lateral view (c) of males of *Panscopus* species: 71. *P. coloradensis* ; 72, *P. squamifrons* ; 73, *P. abruptus* . Scale bar represents 1 mm. Abbreviations: b, belt of tegmen; is, internal sac; mb, manubrium of tegmen; ml, median lobe; ms, median strut; t, tegmen.



Figs. 74-76. Pygidium (tergum 8), spiculum gastrale, and associated structures of males of *Panscopus* species: 74. *P. ovatipennis* a) dorsal view of tergum 7 (t7), pygidium (pg) and apex of apical tubular structure (at), b)ventral view of spiculum gastrale (sg), pygidium and apical tubular structure, c) lateral view of the same structures. 75. *P. gemmatus* : a) dorsal view of pygidium, b) ventral view of spiculum gastrale and pygidium. 76. *P. abruptus* : a) lateral view, and b) ventral view of spiculum gastrale and pygidium.

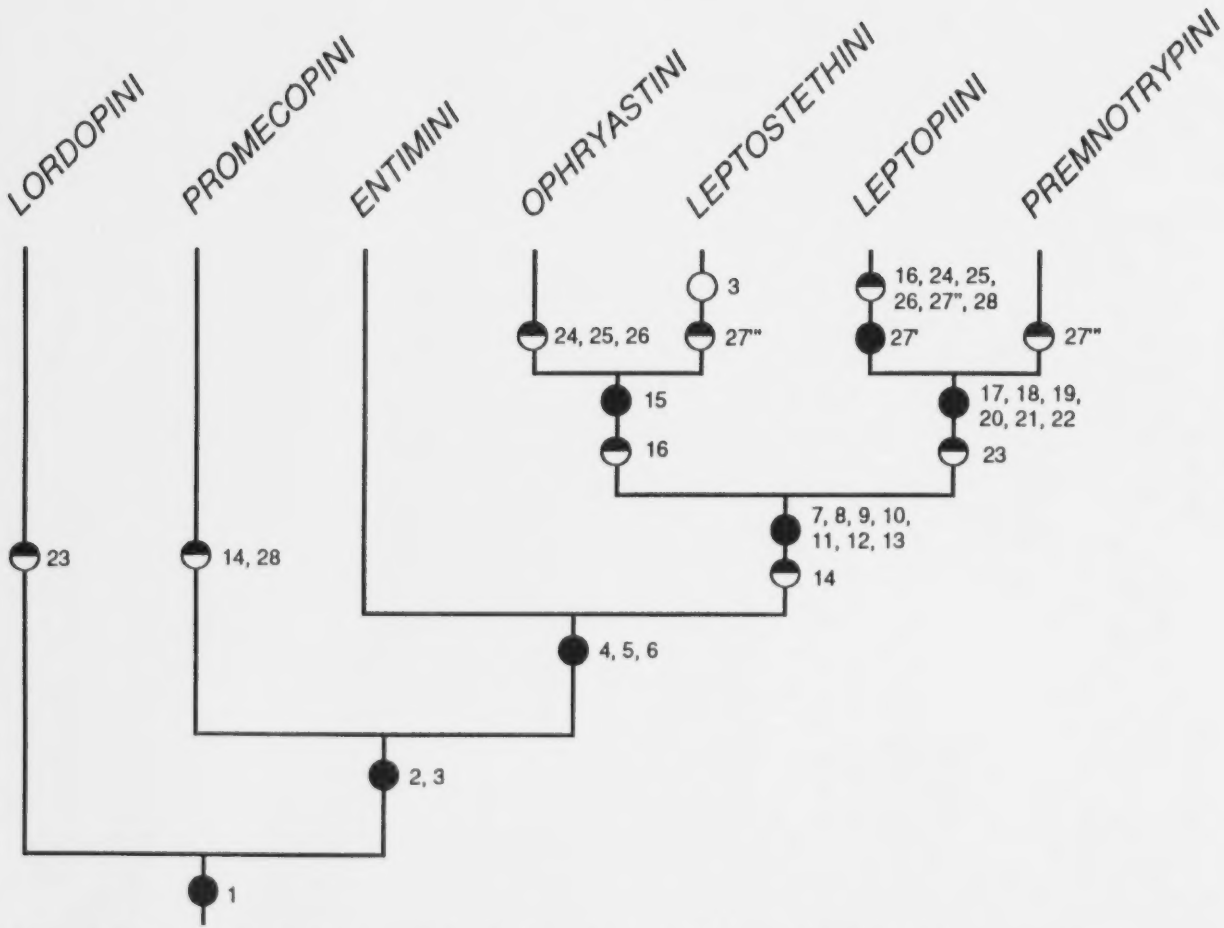


Figure 77. Reconstructed phylogeny indicating hypothesized phylogenetic relationships among tribes of Entiminae. Dots indicate primary apotypies, open circles indicate reversals, half closed cirles indicate parallelisms.

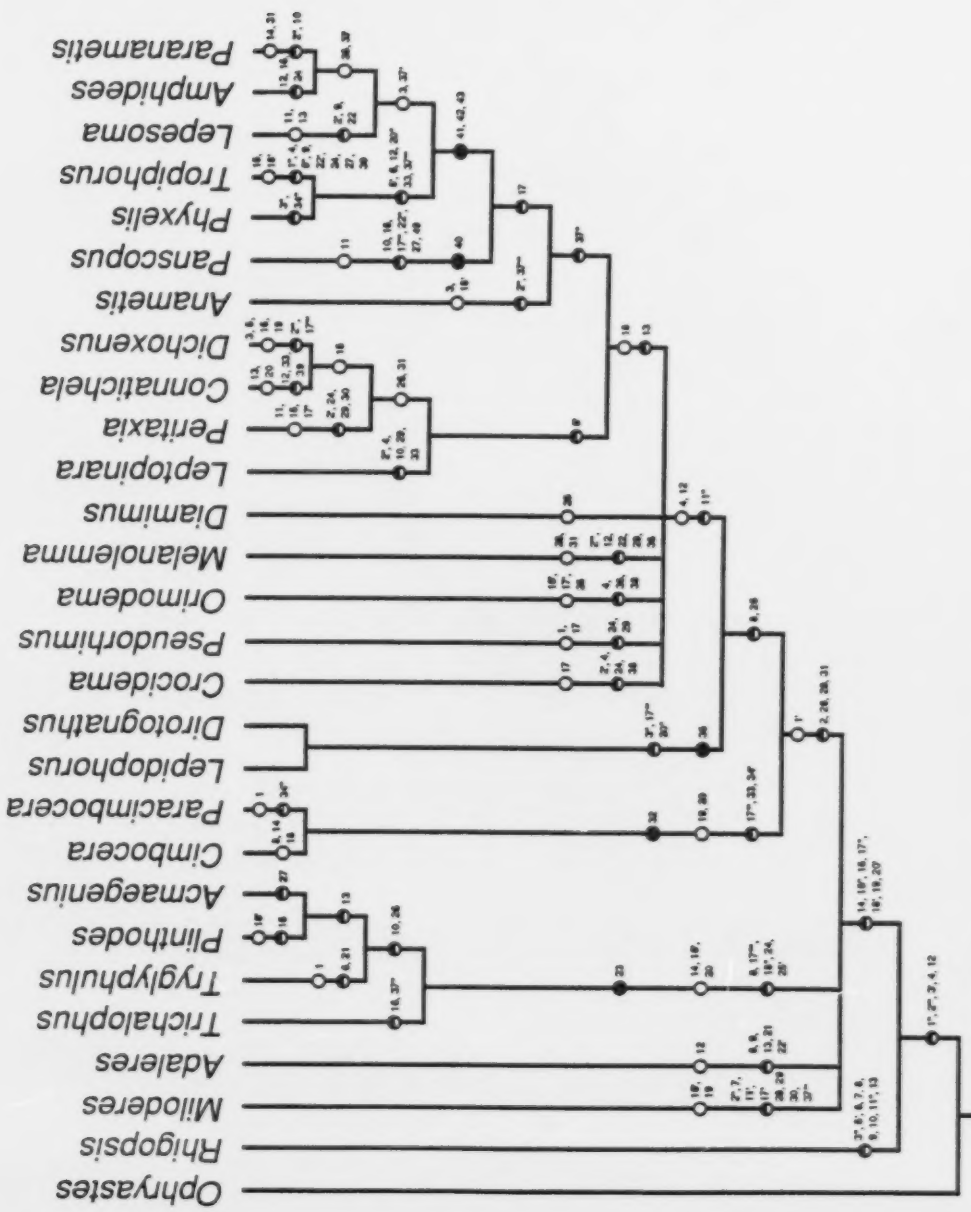


Figure 78. Reconstructed phylogeny illustrating hypothesized phylogenetic relationships among genera of Leptopiini occurring in North and Central America. Primary apotypies are indicated by solid dots, homoplastic characters are indicated by half-filled circles (parallelisms) and open circles (reversals).

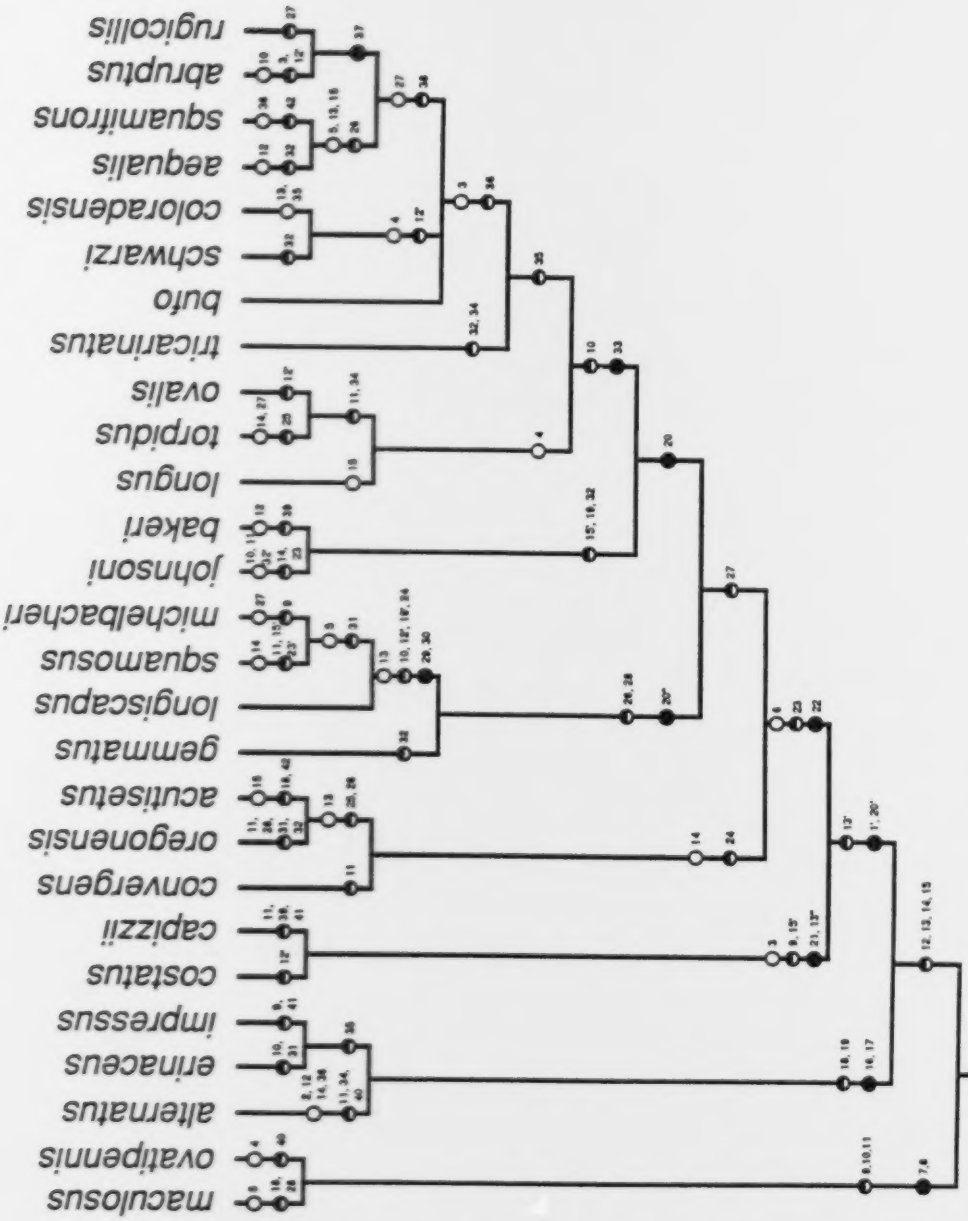


Figure 79. Reconstructed phylogeny illustrating hypothesized phylogenetic relationships among speciesof *Panscopus* . Primary apotypies are indicated by solid dots, homoplastic characters are indicated by half-filled circles (parallelisms) and open circles (reversals).

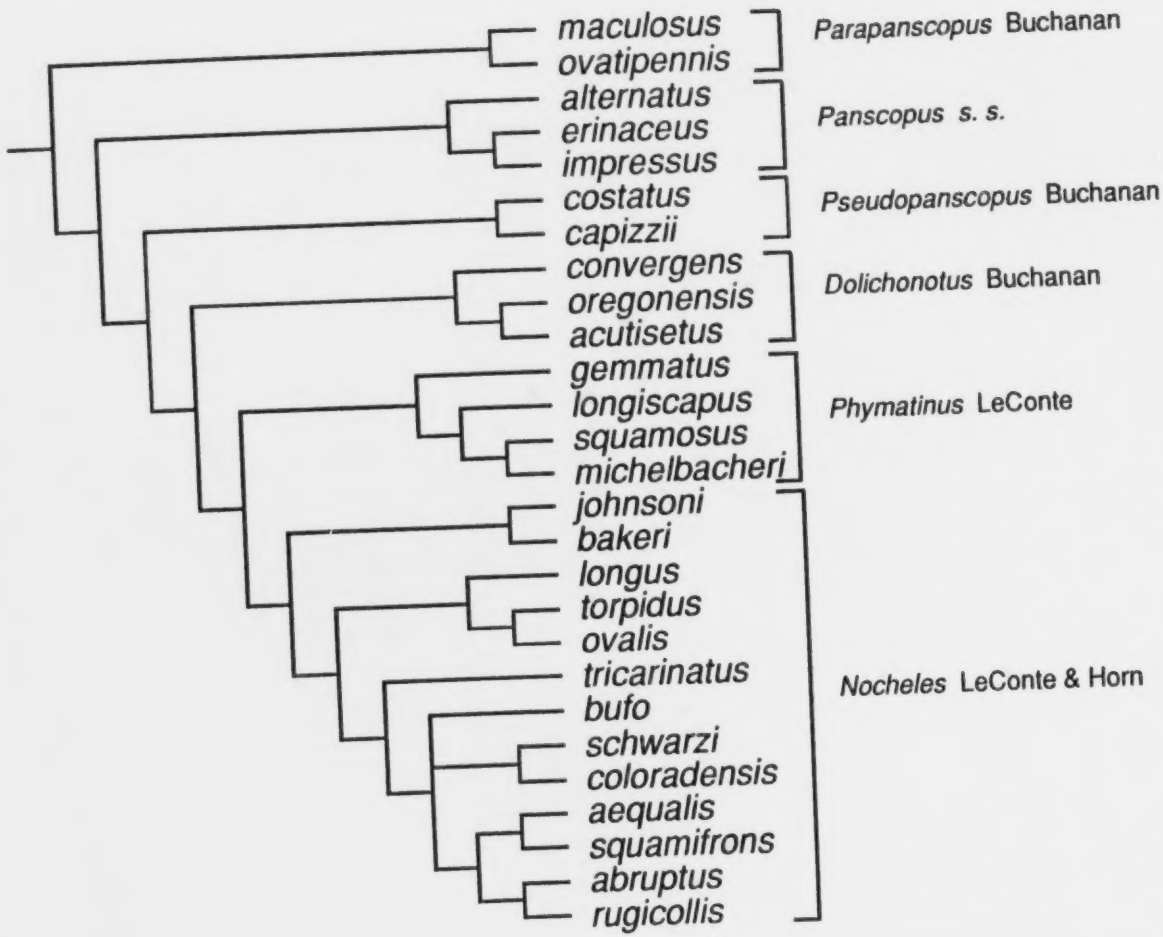


Figure 80. Hypothesized phylogenetic relationships among species of *Panscopus* Schoenherr, and subgeneric names applied.

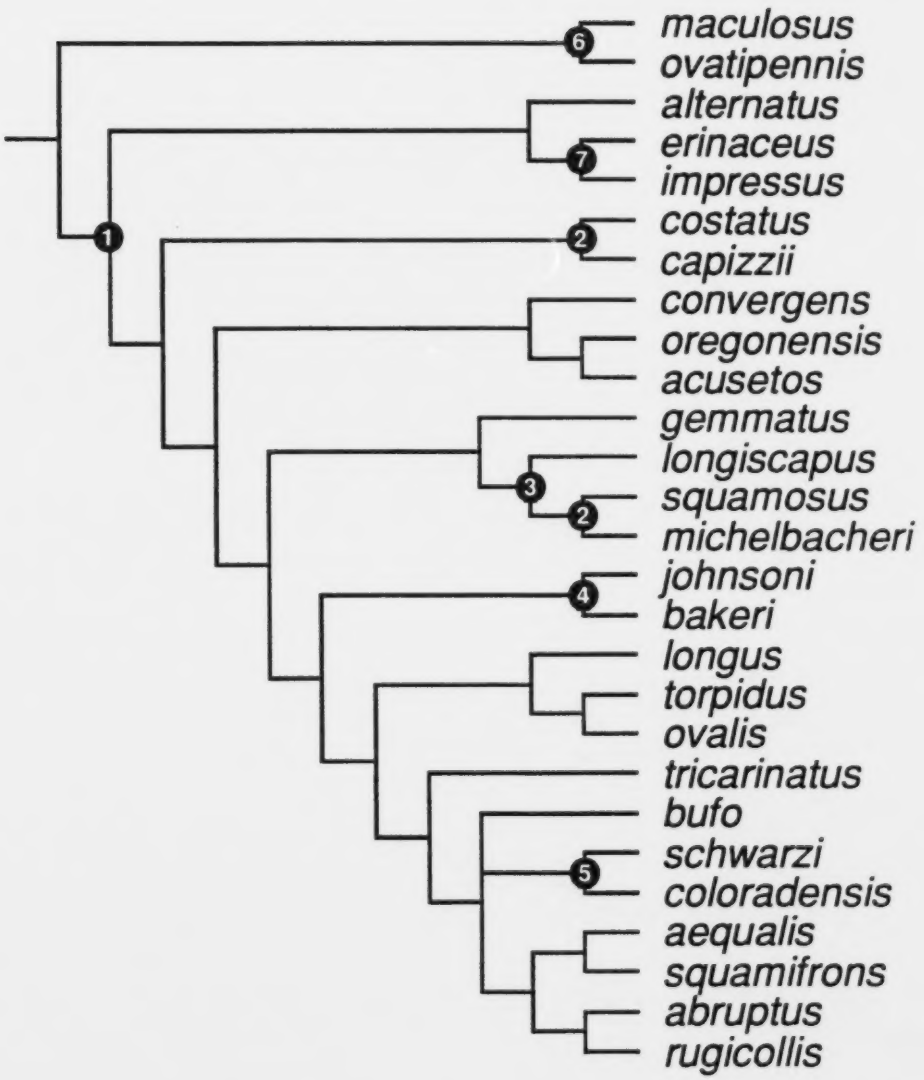


Figure 81. Hypothesized phylogenetic relationships among species of *Panscopus* Schoenherr. Numbers indicate sister groups exhibiting zones of vicariance.